THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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THE UNIVERSAL ELECTRICAL DIRECTORY

(J. A. Berly's).

1914 EDITION

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THE NEED FOR A SCIENTIFIC EDITOR.

WE have had occasion in recent numbers to comment upon the extraordinary enthusiasm with which certain of the daily papers heralded the advent of a new invention. Upon the merits of the invention, both practical and scientific, we have already had our say, and do not propose to repeat ourselves. But it may be appropriate to make a few observations of a general character directed to the need for reform in certain newspaper offices.

Now that some of the great morning papers have begun to publish statistics of daily sales, it appears that we are on the eve of a new kind of newspaper war. The first desideratum would seem to be—increased circulation. It matters not that the standard of the paper is lowered, so long as the circulation is increased; and one method of adding to the number of subscribers is to comment upon some scientific discovery—a miraculous invention, a new cure for a new disease, or a method of extracting gold from sea water. A public trained in the elementary schools has certain smatterings of scientific knowledge, sufficient, at any rate, to make its members read the scientific news. "They must," says the editor, "be catered for; and, by the by, it may increase our circulation. So here goes!" The "pithy par" relating to the latest scientific toy is then inserted, uncensored by any technical mind, and impliedly approved by the editorial "we."

There is grave reason to suspect that some of this zeal for the new-fangled idea is stimulated by the gentle art of the publicity department.

He who would in business rise
Must either bust, or advertise.

Your newspaper proprietor must have his columns filled with advertisements. It pays. Your advertiser must needs have his flaming announcement published on some page of the journal whereon there is some pretence of reading matter. That reading matter need not necessarily be true; but it *must* be spicy and it must be *readable*. If it can be linked up with the wares advertised, so much the better for both parties. The advertiser gets more publicity; the advertisee can charge more for his columns. Look at the "Motor Notes" which appear in so many papers. Is it a mere coincidence that "motor" accessories of all kinds are advertised on the same page? Is it by accident that the writer of the "Notes" illustrates his points by referring to the goods sold by firms whose names are set forth, in leaded type, hard by the emanations from his pen?

The up-to-date advertising agent can apply this system with considerable success to a new invention which is going to revolutionise industry. The discoverer of perpetual motion enters the office of a daily paper, carrying his machine in a carpet bag. He interviews the news Editor. Straightway a note is sent round to the advertisement manager. Further colloquy takes place, and on the morrow there appears an account of a strange and epoch-making device. The announcement occupies a column and a half; while the second half of the second column is filled with an advertisement of a new kind of lubricating oil, which, as it never coagulates, is eminently adapted for greasing wheels which are in perpetual motion.

Is it worth while to throw out a suggestion which may serve to remedy a crying evil? The salary of a new sub-editor would make no substantial difference to the annual balance-sheet of a great newspaper. The services of a man who had sound practical training could be procured at a reasonable figure. He would not even have to devote his whole time to the job, as his services would only have to be called into requisition on rare occasions. No article purporting to describe a new invention should be published except under his supervision. No account of any discovery should be allowed to appear unless passed and approved by him. His editorial approbation would enhance the value of the invention to the inventor and the public; his censure would cause it to be assigned to its proper pigeon-hole in the great library of Truth. If the lay Press is to maintain its great traditions in this country, there seems to be grave need for such new form of censorship. Technical matters should be treated of by a technical man, or else left severely alone. To compare small things with great, what would be thought of the proprietors of a technical journal if they were to interview a political crank, and publish with the seal of their approbation his scheme for the reconstruction of the United Kingdom? They would inevitably lose caste with their technical readers. In the office of a great daily paper which advocates political views of a certain kind, or which supports a certain political party, there are experts who can deal with, and, if necessary, expose the political charlatan; but the proprietors of a technical journal, who own to no political opinions, must needs exclude and ignore him altogether.

Were the *Daily* ——— to advertise for a technical journalist who could keep it straight in matters of scientific interest, there would be hundreds of applicants for the post. Incidentally, too, the appointment of such a man would have this effect. It would become attractive and valuable to the inventor to have his work "reviewed" in the columns of a paper known to have an expert on the staff. If a journal is famous for its literary criticism, your author is glad to submit his work for criticism. The reading public, seeing a favourable review, will respect the criticism, continue to subscribe to the journal in question, and last, but not least, buy the book reviewed, or order it from the library.

SIR RONALD ROSS.

An appeal to the Government by Sir Ronald Ross for a grant of money to compensate him for personal outlay and losses involved in his investigation of malaria, opens the question of the State endowment of Science in an unusual form. The point is raised on an exceptionally advantageous case, as the merit and success of the work are exceptional and unquestioned.

Ross's work on malaria, Jenner's on vaccination, Simpson's introduction of chloroform, Lister's antiseptic treatment, and Pasteur's work on rabies, stand, we suppose, in a class by themselves. These men have saved human life on a scale on which no soldier has been able to destroy it. And the case is not one in which the discoverer has received no recompense. Honour and fame he has, with years and energy to enjoy them. The Nobel prize is substantial, and the salary of his Professorship is probably adequate.

The claim advanced is simply this. That a State ought to pay for scientific work by which it profits, without regard to its having initiated or countenanced it. Two grounds are alleged: (1) The ground of honour; (2) the ground of expediency; and the English Government are said to have admitted their liability when they remunerated Jenner, Manby, and others. Whatever force there may be in the argument of expediency, there seems to be none whatever in the argument of honour. The introduction of the word is a complete misuse of terms. No one would dream of applying the word "dishonourable" to an individual, still less to a trustee, who refused to make money payments for work he had not contemplated; and our Government is a trustee. Even if there were an ethical obligation for payment, on whom would it rest in this case? The benefit which the British Islands have received from Sir Ronald Ross's work is infinitesimal compared with that which the United States have received in Panama, or the Governments of India, Egypt, and the Tropical Colonies in their several domains. Our Treasury is not responsible for debts of honour of other Governments to our subjects. The word "dishonourable" can hardly have been used seriously. The honour of a nation is something different from that.

Let us turn to the argument of expediency. Sir Ronald Ross argues that a nation is unwise if it does not compensate losses incurred in successful research, since the refusal discourages searchers and inventors, and proposes that a sum of £20,000 a year should be set aside to provide useful pensions for all the higher forms of intellectual effort. What is a useful pension? For a judge £3,500 a year is considered useful; and for a politician who reaches the Cabinet £1,200 is the accepted figure. We can find as many judges as we want, and could fill a cabinet of the largest size twice a year. How many doctors can we produce of Sir Ronald Ross's rank? By our reckoning, four in a century.

The great achievements of science, letters, and religion have no calculable relation to money, and the men who can do these things will do them in spite of all difficulty, and do them because they must. Fame is the spur, and money can do little to encourage or discourage them. Nor can we look to any official body to reach the man of genius when he wants help. The argument from expediency seems to fail with that of honour. Again, the payments voted by Parliament to discoverers in previous cases have been clearly as of grace, and established no rule for the future. A claim as of right is ill-founded. Though, however, the immense value of the return from Sir Ronald Ross's work does not seem to establish a claim for payment, we are sure no one would be displeased to hear that a substantial grant was to be made.

But we hope the appeal may effect more than this. It is another brilliant illustration of the mere money value of scientific work, and another argument for spending money on scientific education, the case for which seems almost too clear to be arguable, but may be stated once again. Our public secondary schools, from Eton and Winchester down to small endowed schools in provincial towns and villages, have a curriculum based in the main on the literary scheme laid down by ancient grammarians, and established in England by the revival of letters. Polytechnics and similar schools in great towns are mainly occupied in teaching special arts, not in the general education of the boys, and do not substantially affect the last statement. Nor does the fact that some science forms part of nearly every curriculum. The normal schools of the boys who are to be the leaders, directors, managers, of our technical affairs are, in the main, literary schools, in which science is a mere accessory.

Now it seems undeniable that the majority of boys—perhaps of girls also—would acquire a broader and sounder education from biology, physics, and chemistry, with music, letters, and art as accessories, than they now receive from dead languages. Can we not look forward to the establishment through the whole country of secondary schools working on a scientific curriculum? Our ancient endowed schools are much more than the equivalent of the Gymnasia of Germany, but we want the other schools as well, and we may read into Sir Ronald Ross's appeal a new and emphatic statement of the economic value of the science schools, the Realschulen, which are prominent among the causes of Germany's development. Even with the greatest activity 30 years will be none too long to develop the system and produce the staff of trained teachers, and we have lost far too much time already.

Australian Labour Questions.

It will be remembered that about three years ago the relations between the tramway employers and employés in Australia became acute. The points in dispute were taken before the Arbitration Court, and after a hearing occupying 93 days, judgment was given by Mr. Justice Higgins on December 21st, 1912. This judgment defined the wages to be paid in a number of cases and gave legal sanction and force to a number of agreements which had been arrived at between the men and several of the companies. In one case, that of Brisbane, it was decreed that other things being equal, preference was to be given by the company to members of the men's Union. This was strongly resented by the company, who, in company with the Adelaide Tramways Trust, from first to last refused to admit the jurisdiction of the Federal Arbitration Court and took the case to the High Court of Australia on a number of points, including several constitutional questions.

The decision of the High Court has recently been given to the effect that the Arbitration Court is subject to its authority, and that it has power to revise or modify its decisions. This decision, which is held in many quarters to be contrary to the intentions of the framers of the Arbitration Act, places the findings of the Court at the mercy of any flaw in the legal conduct of the case, and postpones for long periods the operation of the award. The feeling in Adelaide amongst the workers is very bitter, and an early strike is feared. It is nearly 18 months since the award granting them higher wages was given, they have not received them, and now the prospect of their ever getting them is decidedly remote. Stronger measures are urged, and the hands of those who are striving for the solution of industrial disputes by peaceable means are weakened. We await news of the later developments.

Copper.

The position of the copper market is not improving, even if it is not actively deteriorating. The last statistics made an indifferent showing, but they were received with complete equanimity by the market, in which interest has been dwindling steadily for some time. During the month ended May 15th, the stocks in England and France increased from 12,732 tons to 15,465 tons, and the total visible supply from 27,203 tons to 30,284 tons. Compared with the last few years, the present figures, however, are very small, for at the end of April last year the total visible supply in Europe was 43,828 tons, in 1912 59,892 tons, and in 1911 94,768 tons. There are clear signs, however, that in North America production is greatly on the increase, the April output having been a record at 67,634 tons, compared with 65,023 tons in March, 54,714 tons in February, and 58,826 tons in January. The stocks in the United States have also undergone some growth, showing an addition in April of about 2,600 tons to 31,400 tons, but this was the only increase this year. The world's visible supply during last month was added to by 5,700 tons, the total standing at 61,233 tons, compared with 55,572 tons on March 31st, and 62,640 tons at the end of February. On the whole, the outlook does not point to any material improvement in market conditions yet awhile, for there is not the smallest doubt that trade generally is still in a reactionary frame of mind, and no substantial alteration for the better can be looked for in the immediate future. Output is feeling the stimulus of the high prices of recent years, which enormously spurred on efforts at the development of properties. Hence enlarged yield, the effects of which are being felt, though with much less acuteness than might reasonably have been expected. There are what appear to be pretty sound reasons for thinking that the production in the United States is now about reaching its maximum for a period. Last year considerable discussion was caused by the apparent discrepancy between the copper production of the country as returned by the smelters, and that issued by the refiners. This, however, was capable of a very simple explanation, which was that the smelter capacity had been greatly increased, so that the refiners could not keep step with the output of rough material. Since then, however, the position has changed with the putting into commission of new refining plants, and to-day the refineries are capable of handling more raw material than that produced from day to day by the smelters. Whereas formerly, therefore, there was a stock of rough material in the hands of the smelters awaiting refining, this has been largely eaten into, and to-day the refineries are in a position to handle more stuff than the smeltery output affords them. For this reason it would appear that the American production of refined copper is not likely to undergo much expansion in the next few months. Meantime while the leading producers of metal profess comparative indifference to the current of demand reaching them, there is equally not much desire on the part of the trade to anticipate requirements, and new business remains reserved. Things, on the whole, are rather poor, and the speculative market can hardly be expected to form the centre of interest again until there is some fresh development. This may possibly be forthcoming from the long expected railway rate decision in the United States, for which people are getting tired of looking, however. Consumption generally is quite fair, but falls short of the top figures of last year.

Oil Fuel.

The City is always resounding with the cry of an oil boom which does not come. That is to say, it comes not in the shape of the public purchasing all the watered share capital offered by promoters. Possibly the public have discovered that, like rubber, oil is being used as a basis for much financial jugglery. Considering that some years ago oil could be bought on the Thames for 30s. per ton, it seems reasonable to suppose that at double and treble that figure, the bulk of the increased price above the old profit rate of 30s. must represent increased profit to-day of a very extravagant order. Somebody must be making money. A dozen years ago it was pointed out by the author of a work on liquid fuel that the use of oil was never likely to be universal until the production had increased to a much greater extent relative to the production of coal than the ratio of 5 per cent. to which it had then attained. This ratio has not yet been much exceeded. Oil production has increased, but so also has the output of the world's coal, and there is nothing yet in sight to warrant any belief in the rapid change of the above ratio or even in some future change. It was held that liquid fuel was the fuel of the emergency. The popularity of the petrol-driven car has forced up the production of oil, and the high prices have induced every effort to augment it.

The increasing use of oil in the Navy warrants the endeavour being made to find oil in these Islands. Little is being done, but oil can be extracted from coal by systems of low-temperature distillation. The use of oil in the Navy should certainly make for efficiency, and systems of low-temperature distillation ought to be encouraged, so that irrespective of large stores there may be no shortage of fuel at a critical moment. It is perhaps fortunate that oil is so dear, for it will thereby be kept out of use by the steam-users, who may not recognise the significance of facts. Liquid fuel cannot become a steam-user's fuel ashore except to a very limited extent; it can help the ordinary boilers to cap the load peak with full-pressure steam.

But let nobody listen to the promoters' glib talk of oil fuel as though it were unlimited in amount. Doubtless many steam-users regret the day they put in oil-burning furnaces, for the price to-day is quite beyond the purse of the steam-user. Liquid fuel has its special uses—they must, we fear, remain special until such time as the liquid portions of bituminous coal are extracted by some method of low-temperature distillation, whereby the more valuable constituents of coal are preserved for other industrial purposes than combustion. Great Britain holds a great potentiality of liquid fuel and ought very soon to be able to assure herself an ample and cheap supply for the Navy, so rendering herself free of the exorbitant prices for oil now charged by the foreigner. This matter is of vital importance, and affords a great and profitable field for scientific research and paying industry. It has an immediate bearing upon the price of electrical energy, for when the possibilities of coal are utilised to the utmost the cost of fuel for the generation of electricity will be greatly reduced.

D

SHOULD THE COUNCIL BE BLAMED?

By C. H. WORDINGHAM, M.Inst.C.E.

Though an ex-member of Council, and elected to serve in another capacity on the next Council, the writer is at present in the position of an ordinary member of the Institution, and he trusts, therefore, that he may, without impropriety, comment upon the article in the current issue of the Review.

The article deplores the failure of the so-called "forward" policy of the Institution, and blames the Council for not persevering in it, warning it that the Institution is liable to degenerate into a technical debating society.

After all, is a technical debating society, such as, for example, the Institution of Civil Engineers, such a very contemptible body? It is true that the commercial element is of vital importance to the industry—he would be a senseless visionary who could doubt it—but let the pure science be cut off for 10 years, and where would the engineer be? Let engineering talent be withdrawn for a similar period, and where would the commercial man be? He would have to find a new outlet for his capital and his energies. Let us not be blinded by the importance of the financial man, the organiser and the salesman; they are absolutely necessary and worthy of all respect, but their sphere of usefulness is absolutely dependent on the discoverer, the inventor and the engineer.

No one with the ordinary equipment of intelligence can fail to desire the protection and furtherance of the industry by which he gains his livelihood, but it is at least open to argument as to what are the best means of securing the desired end. Why must the Institution do everything; and why is the multiplication of associations necessarily to be deplored?

The starting of new organisations to cover the same ground as old ones can rarely, if ever, be justified, and is nearly always an unmixed evil, but the formation of an association to do specific work that cannot otherwise be done efficiently, is quite another matter, and may produce most beneficial results. People, especially if enthusiastic, are fond of labelling their own policy as a "forward" one, but it is well to make sure that the title is merited.

The writer has always entirely disagreed with the policy inaugurated a few years ago in connection with the affairs of the Institution, and felt sure that it was doomed to failure. The collapse has come far sooner than he anticipated, but that it would come was inevitable. It is absolutely impossible for a heterogeneous body like the Institution to represent adequately the commercial interests of any one section of its members. The interests of one section may be, and often are, directly antagonistic to those of another; how, then, can the Council represent with any fairness the interests of either to the outside world? If their whole weight is thrown in favour of one, it is grossly unfair to the members constituting the other; if they halt between two opinions, their aid is useless to either party. It may be said that they should reconcile the opposing interests; in nine cases out of ten, this is impossible and the only real solution, as in the affairs of nations, is an appeal to arms, and each must fight the other to a finish, both using their full strength. It is unfair, and it is foolish, to blame the Council for failing to accomplish the impossible, though they may justly be blamed for attempting it.

The Institution has a wide legitimate field of great usefulness to the industry in promoting scientific and engineering research; in organising discussions on purely scientific and on engineering matters both in their technical and commercial aspects; in providing facilities for the acquirement of information by its members, whether by means of its reference library, its lending library, the demonstration of new discoveries or technical processes, the exhibition of new inventions or the preservation of articles of interest, either historically or on account of their illustrating some peculiar occurrence or phenomenon; in organising visits to foreign countries or to places of exceptional interest in this country.

Surely here is a field that can well occupy the attention of the Council and provide an adequate return to the members for their subscriptions. Let the Institution leave the non-engineering aspects of every section alone, not because it is undignified for it to deal with them, but because it is quite incompetent by its constitution to deal with them.

The writer believes it to be a fundamental truth that the material interests of the members engaged in any particular section of the industry can only be adequately looked after by those members themselves, for the interests of all must be identical if effectual action is to be taken. A conspicuous example of the value of an association for a particular interest is the I.M.E.A. This Association has won for itself a unique position; it represents the municipal electrical industry adequately, and can speak with authority and weight on behalf of the municipal stations of this country; if it wants to fight, it can fight whole-heartedly, and if it chooses to compromise, it can do so. This is only possible because it is purely municipal and has no other interest to serve.

Let every other section follow this example; there are signs that the wisdom of doing so is being recognised. The consulting engineers have formed an Association, to which many of them belong, having for its object the promotion of the well-being of that important branch of the profession. The manufacturers have formed the B.E.A.M.A., and the advantages of the existence of such an organisation are already manifest, not the least being the fact that it is now possible to obtain the collective and authoritative opinion of any section of manufacturers on any question affecting them, for example, in connection with standardisation of manufactured articles.

For many years the writer has urged that the method indicated is the only adequate and practical way of protecting and fostering the electrical industry, and this seems a fitting opportunity of emphasising it. Let every branch of electrical activity be represented by its own association for the protection of its individual interests—municipal engineers, company engineers, tramway engineers, consultants, manufacturers, teachers, telegraph engineers, telephone engineers, wiring contractors, vehicle builders, and so on. Let them fight one another as often and as furiously as is necessary, and let the best side win. Let each properly constituted association be recognised by the Institution, and be represented on the Council, and we need hear no more of abortive Industrial Committees, nor witness periodical attacks on the Council because they do nothing for the industry.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Comparative Economics of Tramways and Railless Electric Traction.

In the communication appearing in your issue of the 15th inst. criticising my paper read before the Institution of Civil Engineers, points are raised which were brought forward during the subsequent discussions.

I should be sorry, however, for the views expressed by your correspondent to remain unchallenged until the publication of the Minutes of *Proceedings*, and I should therefore be obliged by your insertion of the following reply.

With regard to the question of earning capacity, which I have assumed in my diagrams as the same as that of the tramcar, your correspondent, in common with other critics, falls into the error of assuming that the capacity of the cars at present running is the limit of the capacity possible with the railless car.

As a matter of fact, these cars are designed of a capacity to suit the requirements, but this by no means represents the maximum capacity. The railless car, with top seats, carries 40 passengers. A new type, lately shipped to the East, single-decked, and with two compartments, carries 56 passengers. Another type is designed, also for Oriental

conditions, having a trailer attached, and carrying together 70 passengers.

There is, however, no reason why the power car should not haul two trailers. In Amsterdam, where the streets are narrow and the traffic very dense, the tramcar, single-decked and of the same capacity as a railless car, hauls either one or two trailers, according to requirements. This operation is referred to in my paper, and shown to be quite economical. It bears favourable comparison with the method adopted in this country of running cars of maximum capacity at the same time interval all through the day.

Without, however, going further into the carrying capacity of railless cars not yet running in this country, I will confine myself to an analysis of figures given in the Board of Trade returns of the actual earning capacity of railless cars.

In my paper I made a comparison of the capital expenditure and route length of the York tramways with what would have been the result if the installation had been by railless electric traction. I will now further compare the results of earning capacity on the York tramways with those of the railless electric line at Rotherham.

According to your correspondent, the earning capacity of the railless line should be assumed to be in proportion to that of the tramway as 1 : 1·6; in other words, the railless car to take 62½ per cent. of what is taken by the tramcar.

The Board of Trade returns up to March, 1913, of the York tramways, which had a route length of 6·225 miles, showed a car-mileage for 365 days of 602,623, thus 265 car-miles per day per mile of route. The returns for the railless line at Rotherham, 4·7 miles in length, showed a car-mileage during 178 days, since the line was opened, of 56,887, thus 68 car-miles per day per mile of route.

The much greater traffic density at York is certainly no ground for expecting the receipts per car-mile to be lower than those at Rotherham, other things being equal. The gross receipts at York were 9·012d. per car-mile. According to your correspondent, therefore, if there had been a railless line at York instead of tramways the receipts would have been not more than 62½ per cent. of the tramway receipts, thus 5·622d. per car-mile.

At Rotherham, however, the receipts were 10·35d. per car-mile. The cars in service there are only single-decked, and seated for 28 passengers. There has been considerable overcrowding on them. They would not be suitable for the complete transportation of the population of York.

I will put it, however, to your correspondent whether in the face of the above figures, he holds that if the railless system had been installed in York, using either top-seat cars carrying 40 passengers or running trailers when required with an aggregate capacity of 70 passengers, the railless car would still only take 5·622d. per car-mile? It seems to me a *reductio ad absurdum*.

Your correspondent goes on to take exception to my assumption of equal expenditure on the overhead equipment. This objection is trivial. My analysis of capital expenditure and maintenance of tramways is taken from the averages of the returns which are practically such as one must estimate for railless lines. The extra trolley line does duty in the transmission of the energy. For instance, for a line of the traffic density of the one at Rotherham I assume in my diagrams £1,200 per mile as the capital cost of overhead equipment. The actual cost at Rotherham was £1,100 per mile. The cost of maintenance is in my tables assumed at 0·155d. per car-mile. At Rotherham it was 0·120d.

Your correspondent then takes up the question of road maintenance, and instances the case of Dundee, where the road has been found too weak to stand the traffic of the railless car, and will require to be rebottomed.

He considers that a tramway would have been preferable. I think it is somewhat out of date now to begin disputing the question of rails with a limited width of paved road *versus* a completely paved road suitable for all traffic.

The advent of the mechanically-propelled vehicle is for all time, and has come upon us with a rush. It claims the creation of a highway system, *intact*, *substantial*, *smooth*, *dust free*, suitable for transport both of passengers and goods by heavy vehicles moving at a rapid rate.

Your correspondent charges me with ignoring the subject of road surface improvement. I have not ignored it; I stated in my paper the fact that the recent Acts of Parliament have included a charge of ⅜d. per car-mile for this purpose. I have not, however, adopted this or any other figure as an ascertained fair charge, because no one is in a position to do so.

The present burden on the householder-ratepayer for the upkeep of the roads is out of proportion to that of the proprietor of vehicles, whose use of the roads is a more direct one. Some redistribution of this burden is probable. But the whole community uses the road, and all should pay their proportion.

There should, however, be some discrimination in favour of public carriers. If they are squeezed between the upper millstone of unremunerative fares for the working classes and the lower millstone of high charges for road maintenance, they will be squeezed out of existence.

The public carrier should not be classed as regards taxation with the millionaire who keeps a dozen or so of motor-cars purely for his own convenience and pleasure.

The Government appears to take the view that the problem of road reconstruction is an Imperial one, and has taken the first step towards its solution by the appropriation of Imperial revenue for that purpose; whether, or to what extent, it will also increase the carriage licence duty, who can tell? If so, there would be no sense in attempting a charge per car-mile on public carriers, which is only capable of determination in the case of regular services. The tax should be levied on each vehicle according to its class and capabilities of use. If it is unused, that is the owner's affair. If he does not want to pay the licence any longer, he can sell it or scrap it.

I cannot see what useful purpose is gained by trying to reduce the road damage down to a figure per car-mile. The subject must be threshed out comprehensively, and as far as public carriers are concerned the fare adjusted to the cost of operation. If the passenger pays the parliamentary fare of 1d. per mile, probably the motor-omnibus or railless car could afford to pay from 1d. to 2d. per car-mile towards road maintenance. If the fare is only ½d. per mile, it is doubtful whether the motor-omnibus can afford to pay ⅜d. per car-mile.

Moreover, where a road has a weak bottom, mechanical traction will destroy it; where it is of the character of London streets, it will make scarcely any impression on it. If you send a 100-ton locomotive over a piece of portable track, you will need a new portable track next day, and probably a new locomotive. If you send it over rails of 100 lb. per yard, the wear is infinitesimal. It is the same thing with roads.

In the good work done by the Road Board in the registration of traffic density on main roads, the figures range from 35 tons up to 5,000 tons per day, as great a variation as between a portable track and a main-line railway.

T. Graham Gribble.

London, E.C., *May 19th*, 1914.

"Schoeller" Miners' Lamp Gas Detector.

I note a letter from Mr. W. Schmahl in the current issue of your journal referring to my letter of last week. His letter has the merit of being crisp and business-like, and, like Mr. Schmahl, I have no time to spare for lengthy discussion.

I think, however, it only just to say that, contrary to his statement, my letter proves neither that I have failed nor that he has succeeded, and I think it would be reasonable and of general interest to very many engineers if Mr. Schmahl would state whether he would guarantee the Schoeller detector to give, say, five reliable consecutive measurements of methane if the firemen remained in, say, 2 per cent. mixture for 15 minutes, without access for fresh air—a very ordinary condition of working in the pit.

Favourable statistics and guarantees on this point would assist Mr. Schmahl in popularising his instrument.

Fred J. Turquand.

London, W.C., *May 25th*, 1914.

Review of "Electrical Meters."

In your issue of May 15th, Mr. A. P. Young deals with a question raised by us in a letter published in your issue of April 24th. In this we advocated the statement of the error of an instrument as a percentage of the reading rather than of the true value, on the ground that it was certainly more convenient, and probably more logical also.

Mr. Young, on the other hand, is in favour of the alternative proposal which he regards as more logical, no less convenient, and, in fact, as having "everything in its favour."

As regards convenience in use, we are strongly of the opposite opinion for the following reason :—As an example, let it be supposed that a certain meter indicates a consumption of 150 units and is known to be running 3 per cent. slow. It is undoubtedly a simpler matter to add 3 per cent. of 150 units (4·5 units) to the reading (making 154·5 units consumption) rather than to have to divide the reading by 100 — 3/100, which is necessary under Mr. Young's convention.

As regards the logical sequence of thought involved in the two conceptions, the example afforded by a clock dial may perhaps be cited. Suppose it is known that a certain clock is five minutes slow, and the time indicated is 10.47. The straightforward process would seem to be to add five minutes to 10.47, giving the correct time as 10.52. Mr. Young, on the other hand, would have us try to work out what time would, when five minutes had been deducted from it, give the time shown on the clock dial, namely, 10.47.

These two processes appear to us to represent very fairly the respective trains of thought entailed by the two methods.

At the same time, whatever may be their respective merits, we certainly agree with Mr. Young in his suggestion that the matter should be definitely settled in the meter specification now under revision, and, we would add, in the ammeter and voltmeter specification when this comes up for reconsideration, as it is hoped may shortly be the case.

Everett, Edgcumbe & Co., Ltd.,
KENELM EDGCUMBE, *Director.*

London, N.W., *May 25th*, 1914.

The Institution and the Electrical Industry.

It is to be regretted that so little of the affairs of the Industrial Committee is known to the 5,000 Members and Associate Members. The member who is not on the Council, but who has extracted from the opportunities allowed to him a sufficient basis to form an opinion of the desirability of the "unanimous opinion" of the Committee carrying conviction to the Council, has insight and capacity which the Institution should utilise in other directions, when he is discovered.

Will the statement of Mr. Hirst be printed? Because a ridiculously small number of members heard very indistinctly his remarks at the annual meeting on Thursday, at 5 p.m.

Was that hour selected to suit some individual members of Council? It certainly does not suit the majority of those who could attend an annual meeting. I have not counted how many of the Members and Associates live near enough to attend, nor did I count the few who did attend. I note, in passing, that the Council was not present as a whole.

My object in writing to the ELECTRICAL REVIEW is to endeavour to learn whether it is the wish of a majority of Members and Associate Members that the work initiated by Dr. Ferranti shall come to an untimely end. For one, I have endeavoured to follow, from outside, the progress of that Committee, and I feel extremely dissatisfied with the incapacity displayed by dissolving a Committee that is admittedly "unanimous" in its decision that it needs more scope.

By reasonable, concerted action we can demand and secure sufficient details to form an opinion as to the actions both of Council and of the Industrial Committee. I am criticising neither, for the best of reasons.

Is there in our non-political Ireland an Ulster?

The opinion of Dr. Ferranti and other members on the dissolution of the Committee would interest me.

I do not want the Institution to become anything less than "the widest representation of the industry."

I believe the formation of the Industrial Committee had the sanction and goodwill of more than a three-quarters majority of Members and Associate Members.

Will you, Sirs, publish a form for those of your readers who are included in the voting classes of the I.E.E. to return to you, to learn whether there is a desire for more information and for renewed life to the Industrial Committee? I suggest the following, so that it can be cut out and signed and returned :—

"The Institution and the Electrical Industry."
c/o ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C.

1. I { will / will not } support a request to the Council of I.E.E. and to the former members of the dissolved Industrial Committee for a full joint statement to Members and Associate Members of the I.E.E. of the reasons for the dissolution and reasons for and against complying with the unanimous opinions of that Committee, as reported to the Council.
2. I { will / will not } support a continuation of an Industrial Committee.

Signature and class in I.E.E. .....
Postal address .....

Not a Member of Council.

London, *May 23rd*, 1914.

[Mr. Hirst's statement is printed elsewhere in this issue. As regards the proposed referendum, it is not for us to enter the lists; if the members themselves are sufficiently interested to commit their views to writing, our "Correspondence" columns are open to them.—EDS. ELEC. REV.]

The Weekly Rest.

With the rejection of the Weekly Rest Day Bill in the House of Commons on Friday last, all hopes of legislation for a weekly rest day for all workers are at an end for some time to come; the result was not unexpected, owing to some absurd clauses *re* Sunday trading.

The A.E.S.E. having concentrated its efforts recently on obtaining support for the Bill, will now use all its powers to obtain a weekly rest day for station and mains engineers, and also in the case of mains engineers and assistants, to do away with the liability to be called out at any hour of the 24, and compulsory residence in the district concerned for 168 hours every week, by means of some system of relief.

The majority of Councils, Corporations, and chief electrical engineers are entirely in favour of the principle of a weekly rest day, though there seems to be some reluctance in putting the principle into practice; maybe, they are somewhat perturbed as to the effect on the third decimal place in the total costs per unit.

To those who recently read the magnificent report of the Coventry Corporation electricity department (with the lowest cost per unit in the country), it would, perhaps, not have appeared so magnificent if they had known that the employés of the generating department were working seven days per week, and the charge engineers receiving the lowest average salaries for municipal stations of similar capacity (10,000 KW.) in the country. As far as I know, there is only one station of similar or greater capacity where the charge engineers are paid smaller salaries than at Coventry, it being one of 12,000 KW. owned by one of the Newcastle-on-Tyne companies with the ridiculous maximum of 45s. for a seven-day week. It is rumoured in the case of Coventry that the Local Government Board Auditor or Inspector has hinted several times that the salaries be increased, and a six-day week be instituted; though this was not carried out, all employés in the electricity department were granted two weeks' wages as a bonus. I think they would have preferred a weekly rest day.

Recently the employés of the Greenwich power station of the London County Council applied for a weekly rest day; the matter was referred, as is the custom, to the Conciliation Board, and as no agreement could be reached it was referred to an arbitration committee, which decided for some reason unknown that a six-day working week of 48 hours was inadmissible, but agreed to reduce the working hours from 56 to 52. I give this instance to show the extreme

reluctance that exists to carry out the principle of the weekly rest day, though I am sure that in this case all the councillors and heads of departments are in agreement with the principle.

In no other industry where the employés have the same degree of specialised training is there the scandal of the seven-day working week. Especially is a weekly rest day necessary to those who work shift work for reasons of health, irregular hours, night shifts, and the difficulty of obtaining the necessary sleep during the day-time, contributing to the unhealthiness of the occupation.

It was hoped by some station and mains engineers that the Institution of Electrical Engineers might use their influence on behalf of the seven-day week men, a fair number of whom are either Students or Associate Members, but it is the old story of conflicting interests which no doubt prevented them, the same perhaps that dissolved the I.E.E. Industrial Committee recently.

The only hope now for station and mains engineers is the A.E.S.E., which is slowly but surely being built up into an irresistible organisation. The A.E.S.E. does not propose to make extravagant demands, but insists on the principle and practice of a weekly rest-day, and that engineers in all cases must be paid a salary in accordance with their duties and responsibilities, and certainly more than those whom they have under their supervision.

Those who criticise the A.E.S.E. are referred to the advertisement pages of the Electrical Review of recent date. If they compare them with those of 18 months ago before the A.E.S.E. came into existence, it will be noted that in the great majority of junior appointments advertised the salaries offered have increased more than 100 per cent. Working conditions have been bettered and salaries increased in a number of individual stations, and it is well known that station and mains engineers are now treated with much more respect than in the days before the advent of the A.E.S.E.

There are not any paid officials in the A.E.S.E., and the offices and positions on the executive are held by mains and station engineers; the subscription is nominal, and there is no valid excuse why any station or mains engineer should not be a member.

W. J. Ebben, *Hon. Sec. A.E.S.E.*

Leyton, *May 26th*, 1914.

Frequency Changer.

Your correspondent, "F. W. T.," in to-day's Electrical Review is surely mis-stating the facts. The unidirectional pulsating current is of the *same* frequency as the alternating current. If he wants a transformer to *double* the frequency, I have no doubt that I can design him one which shall have a fairly high efficiency, but not quite so high as for a three-fold step-up. (See also my recent paper to the I.E.E. in this connection.)

I have not yet completely worked out how satisfactorily to halve the frequency; but I have succeeded in reducing it to one-third, and this meets most cases, besides requiring no continuous current. I have shown publicly the frequency being reduced from 75 to 25 periods.

A. M. Taylor.

King's Heath, *May 22nd*, 1914.

Street Lighting.

We send you to-day a copy of the *Preston Guardian* of Saturday, May 23rd, containing a report of the Streets and Buildings Committee's decision on the question of street lighting.

A specification was issued by the Corporation engineer to which the Gas. Co. and ourselves were asked to tender for the supply, lighting and maintenance of 90 1,000-c.p. lamps in the central portion of the town. Our prices, £7 10s. per annum for lamps burning 3,500 hours, and £6 for lamps burning 2,000 hours, were £2 and £1 10s. respectively lower than the Gas Co.'s tender.

The gas company, however, offered to reduce the price of street lighting to the whole of the gas lamps now supplied by them by about £400 a year, and to contribute to the Corporation the sum of £500 per annum for three years towards the cost of converting flat-flame burners to incandescent burners.

The Corporation must agree to forgo or limit their powers under the Preston Gas Act (Sec. 45), which entitles them to be supplied with gas for illuminating purposes at the lowest rate offered to other consumers for any purpose.

These concessions and conditions are quite outside the specification, and, in any case, we have no contract for street lighting outside the central area. It is, therefore, impossible for us to compete on equal terms.

The National Electric Supply Co., Ltd.

Thomas Cross, *Secretary.*

Preston, *May 25th*, 1914.

The Wiring of Public Buildings.

This subject raised by your correspondent, Mr. Sykes, is one that is of great importance to the electrical industry. As an ex-employé of the Office of Works, and having a first-hand knowledge of the condition of the wiring in a large number of public offices, I can assure Mr. Sykes that the wiring of some buildings is "rotten." This knowledge is common property amongst the electricians employed by His Majesty's Office of Works Department. I have seen the wiring also of a comparatively recent job, and have no hesitation in saying that it is one of the worst electrical jobs I have ever seen. If the same experts who gave evidence in the Osgood *v.* Sunderland case could see the wiring of these and other buildings they (the experts) would have a fit. I, too, with Mr. Sykes think that a public inquiry should be held, and may say, in conclusion, that to make these various buildings "safe" would require the expenditure of thousands of pounds.

W. J. Webb.

London, S.W.

THE PRINTING TRADES' EXHIBITION.

As we mentioned in our note last week, most of the printing machines exhibited are driven electrically, the greater portion being individually driven. This applies not only to the printing machines, but also to the Linotype and Monotype machines. The latter are driven through belting from small motors placed on the floor alongside the machines, the starting-switch panel being fixed on the side of the machine in a position handy for the operator. Machines like Babcock's, which have no trip motion on the cylinders, are driven by means of fast and loose pulleys. This is a somewhat old-fashioned method of driving machines, but if the loose-pulley drive is not adopted, it is necessary to use a reversible motor for backing up, and this introduces expense and a certain amount of complication, although, on the whole, it would be, no doubt, more economical, from the current-consuming point of view. Most of the Wharfedale machines are driven by spur gearing, as this is the most convenient method, the main driving shaft being fairly low down and at the back of the machine.

The Miehle machines, on the Linotype and Machinery Co.'s stand, are for the most part driven by short belts from motors placed in the side frame of the machine, jockey pulleys being used to take up the slack of the belt and keep it taut. This, whilst a very convenient method from the point of view of the printer, as the motor occupies no space outside the machine, is not so convenient from the point of view of the engineer, and particularly the supervising engineer, as it is necessary to get inside the machine to attend to the brush gear. A more convenient arrangement is that shown at the Miehle Co.'s stand, in the Gilbey Hall, where the pulley is placed on the commutator end of the motor, permitting the brushes to be got at from outside the machine. This method of driving Miehle machines was, we understand, introduced a few years ago by Mr. Broadbent, and we have no doubt that it will in time become the general method of driving these machines. A motor of somewhat small dimensions is required, and at present there

are only a few makers who can supply them of the requisite power and dimensions. Among these makers we might specifically refer to Messrs. Electromotors, Ltd., who are the actual makers of the motors on the Miehle Co.'s stand, and also the whole of the motors on Messrs. Mann's stand and others. In point of numbers there are probably more motors made by this company than by any other firm, due, no doubt, to the fact that they have specialised largely in printing press equipment.

On several of the stands examples of the latest printing methods are shown—that is to say, the Intaglio method, which, it is considered, will create something of a revolution in the printing industry. Whilst there is nothing electrical shown at these stands, the development of this method will mean more work for electrical engineers, as the copper printing rollers are produced electrically, and arc lamps are necessary for preparing the pictures.

In this connection, reference may be made to Messrs. Canning & Co.'s exhibit in the Gilbey Hall. At this stand is a good display of electro-plating plant, including motor-driven plating dynamos and plating vats for copper depositing, nickel facing of stereos, and nickel-steel facing. Some electrically produced copper rollers are also to be seen upon which $\frac{1}{8}$-in. deposit has been produced in 10 hours. The copper is deposited direct on iron, the cyanide process being used for the first coating, and this is followed by the sulphate process, the solution being agitated by air and the deposit burnished in the solution.

At the stand of Messrs. Penrose & Co. a large exhibit of photo-engraving machinery is to be seen, including what is claimed to be the largest camera in the world, and also arc lamps which are necessary for this class of work.

Among the smaller applications which may be mentioned are the self-contained electric grinding and polishing machines for litho stones and zinc plates. These consist of a vertical motor, to the spindle of which the grinding stone or brushes are fixed, handles being provided so that the whole equipment can be easily moved about over the stone or zinc plate. These are to be seen at the stands of Frederick Wesselhoeft, and also in the Haddon Hall.

THE INSTITUTION OF ELECTRICAL ENGINEERS.

On Thursday last week the annual general meeting of the Institution was held; the report of the Council was received and adopted, and the statement of accounts was approved. These were given in abstract in our last issue.

With regard to the dissolution of the Industrial Committee, of which he had been chairman, Mr. H. Hirst said he would like to make a short statement. Although as a Member of Council, he agreed with the wording of the report, absence abroad had prevented him from taking any part in the framing of it, and he was afraid that it might be misunderstood by some of the members who were interested in this question. He had no fault to find with the powers that were conferred on the Industrial Committee so far as the Council could confer powers, but it did not seem to be generally known that the Council considered it essential that the Industrial Committee should not deal with matters which might be construed to have a political bearing. All the Members of Council who were members of the Committee were anxious to respect this wish, but when it was considered that in this country concessions had been granted by Parliament to some 400 municipalities in regard to electricity supply stations, it was very difficult to find subjects connected with municipal electricity supply that did not touch politics. This was also proved by the condition of affairs which arose at the time when Dr. Klingenberg read his paper, when the Council had some fears that the paper might lead to a political discussion. The Council had other wishes which did not appear in the constitution of the Committee, but which had been respected by the Committee. The Council considered that questions which were to the detriment of a certain section of its members should not be dealt with, and some members of the Indu-trial Committee were anxious to respect that wish. Other members of the Committee felt that if a proposition that was for the benefit of the whole industry was brought forward, some section might have to give way or to suffer slightly. The Council having made this ruling, however, it was difficult for the Industrial Committee to choose suitable subjects which were likely to meet with the approval of the Council. Well-known members of the Council who were respected by everybody thought that the high standard of the Institution might suffer if it lent its name to discussions dealing with money matters, such as finance or trade discounts, that were likely to enter into the discussion of industrial questions. They were very anxious that no publicity should be given to any of those deliberations. Whilst within those limitations the Industrial Committee had full powers, he thought it was due to himself, as chairman, and to some of the members who differed from those views, to say that the above were some of the limitations of the constitution which were not referred to in the report, and which acted against the possibility of the Industrial Committee doing such work as it was hoped could have been done. He did not say this as a complaint or as a reproach, but thought it should be understood by those who took an interest in the question.

At a later stage Mr. A. H. Seabrook, in proposing a vote of thanks to the honorary auditors, took the opportunity to say, as vice-chairman of the defunct Industrial Committee, that he regretted that the Council could not see its way to make itself the centre of the electrical industry, not only from the point of view of technical and scientific matters, but also with regard to industrial and commercial questions. After all, whether they were professional or business men, they were all dependent on £ s. d., and whether their interests were technical and scientific, or industrial and commercial, the financial factor was an essential factor in their existence, not only as an Institution, but as individual members of the electrical industry. In his opinion it was regrettable that the articles of association did not seem to allow the Council to take a full share in these industrial and commercial matters. It was evident from the attendance that day, and the complacent attitude of the audience, that members were perfectly satisfied, unlike himself, that the Institution should confine itself entirely to the aims for which it was originally constituted. He did not wish to make any protest or complaint, but merely gave expression to his own regret in regard to the matter.

Mr. Kenelm Edgcumbe associated himself with the remarks of Mr. Seabrook.

Mr. W. M. Mordey, before proposing a vote of thanks to the honorary solicitors, also digressed to say that he was one of those people who thought that the influence, dignity, and usefulness of the Institution would be best maintained and increased by following the example that they had always had before them, of giving their attention to the scientific and engineering foundations of the electrical engineering industry, rather than by attempting in any way to make it a trade association. This principle, from which the growth and strength of the Institution had sprung, was, he thought, in the long run, actually the best and most helpful to the electrical profession.

PARLIAMENTARY.

Leeds Corporation Bill.

Last week the Select Committee of the House of Lords, presided over by the Earl of Plymouth, concluded its consideration of this Bill which, amongst other matters, seeks to empower the Corporation to extend the tramways. The Bill was opposed by the Yorkshire Electric Power Co., and the Great Northern and Midland Railway Companies, and the West Riding County Council.

Mr. Forbes Lankester, K.C., who with Mr. H. Lloyd, K.C., and Mr. Jeeves, were for the promoters, explained that the tramway undertaking of the Corporation was a very prosperous concern. In 1910 they obtained powers to install a system of railless traction, and this had been a great success. The Corporation now proposed to extend the railless system into the districts of Otley and Burley, which were greatly in need of direct communication to the centre of the city. The Yorkshire Electric Power Co. wished to provide the electricity for these extensions, but he submitted that the Corporation could supply their own electricity at a cheaper rate and in a better way. The opposition of the County Council was directed to the cost of the upkeep of roads, and the contention of the promoters was that the trolley cars did not do so much harm as motor vehicles, and they should be treated like ordinary traffic.

Mr. J. B. Hamilton, general manager of the Leeds Corporation tramways, gave evidence in support of the Bill. He explained that the proposals were to carry the existing tramways at Guiseley to the White Cross, and to extend the line at York Road to Walton. The proposal with regard to railless traction was to run trolleys from that proposed tramway extension at the White Cross, Guiseley, to Otley and Burley in Wharfedale. At present the Corporation had 113 miles of tramways, and last year the receipts were £411,531, which allowed of a surplus of £70,000 being paid into the city fund. The Corporation did not agree that they would interfere with the statutory rights of the Yorkshire Electric Power Co.

In cross-examination, Witness said he estimated that the gross receipts from the Otley and Burley route would be £7,218, the estimate being based on the running of 190,780 car-miles at 9d. per mile. He estimated the working expenses at £5,167, and the capital charges, &c., at £1,334. He had put down a further £298 for road maintenance at $\frac{3}{8}$d. per car-mile, but he did this not because he admitted the principle, but in view of the recent decisions of Parliamentary Committees, he wanted to be on the safe side.

A number of local witnesses were called as to the benefit which would accrue to the districts from the proposed further travelling facilities, and Mr. Smithson (chairman of the Leeds Tramways Committee), and Mr. C. J. Spencer (general manager of the Bradford Corporation tramways), also gave evidence in support of the Bill.

Mr. Talbot, K.C., on behalf of the Midland and Great Northern Railway Companies, urged that it was not the province of local authorities to provide transit facilities outside their districts, and argued that the proposed trolley vehicle system was not a real extension of the Leeds tramway system. The position of the railway companies would be that they would have the competition, and, as large ratepayers, have to bear a portion of any loss incurred.

Mr. Ram, K.C., for the West Riding County Council, asked the Committee to say that if the trolley vehicles were allowed, the Corporation should contribute to the maintenance of the roads.

Mr. Woodhouse, general manager of the Yorkshire Electric Power Co., urged that his company were the only statutory company able to supply electric energy in the district under consideration, and they were prepared to supply the Corporation at the rate of 1½d. per unit for 200,000 units, and at a reduced rate when the quantity was increased.

The Committee decided that the Bill should be allowed to proceed on condition that the Corporation should contribute to the maintenance of the roads over which the trolley vehicles ran at the rate of '375d. per car-mile. An arbitration clause was to be inserted in the Bill as to the fixing of the rate at the end of three years, which could be put in operation by either of the parties. The Corporation was not to be required to make any contribution towards the capital expenditure of widening or reconstructing roads. The Corporation was to be permitted to supply electrical energy for the sole purpose of the trackless trolley system on the proposed route.

Birkenhead Corporation Bill.

A Select Committee of the House of Lords, presided over by Lord Barnard, on May 19th, passed the Bill promoted by the Birkenhead Corporation, which, among other matters, sought to enable the Corporation to run motor-'buses in connection with the tramways undertakings.

Mr. Clode, K.C., explained that the Corporation were asking for powers to run motor-'buses so as to provide facilities in districts where development had proceeded beyond the tramway area, and to couple up certain outlying districts with the tramways by means of the motor-'buses. At present all the tramway routes started from the ferry, and the idea was to link up these routes by omnibuses so that people could get across from one route to another without having to come back to the common starting point. It was proposed to spend £17,000 on omnibuses and £3,000 on depôts.

Mr. Vesey Knox, K.C., on behalf of the Cheshire County Council, asked that the Corporation should be subjected to the same conditions as that imposed upon Manchester, whereby the Manchester Corporation agreed to give the County Council and the local authorities a veto over the running of any of the omnibus services so that the whole matter could be discussed between the different authorities.

After consultation, Mr. Solly, the Chairman of the Birkenhead Corporation Parliamentary Committee, said the Corporation would be prepared to make a contribution of ¾d. per car-mile for road maintenance.

The Committee consulted in private, and the Chairman announced that they were not prepared to grant the Manchester clause, but would be prepared to sanction some payment to the outside authorities whose roads were used, for maintenance.

Eventually the Committee passed the Bill subject to the insertion of a clause to the effect that the consent of the County Council should be necessary before the motor-'buses could be run in the outside districts, that the consent should not be unreservedly withheld, and that, failing agreement, an arbitrator should decide the question of the amount of contribution to be paid by the Corporation towards the cost of the maintenance of the roads used by the motor-'buses.

Ashington U.D.C.'s Bill.

After three days' hearing, the Select Committee of the House of Lords, presided over by Lord Lamington, on May 21st, passed the preamble of the Bill promoted by the Ashington Urban District Council to empower them to supply gas within their district, and the parishes of North Seaton, Woodhorn, Cresswell, Ellington, Bothal Demesne, Pegswood and Sheepwash, and to acquire the gas mains, meters, &c., of the Ashington Coal Co.

Mr. H. Lloyd, K.C., for the promoters, explained that there was at present no statutory supply of gas, but the Ashington Coal Co. had a small gasworks in connection with their colliery, and also supplied a number of private consumers. The Northern Counties Electricity Supply Co. came into the district in 1902, and took electric current from the generating station of the Coal Co. By an agreement come to lately, the Newcastle Electric Supply Co. were operating the Northern Counties Co., and there had been some improvement in the supply. There was great complaint in the district with regard to lighting. He objected to any clause being inserted to the effect that no loss from the gas undertaking should be allowed to fall on the rates, as the Electricity Co. might give away electricity for a few years and crush the Gas Co. out of existence.

A great deal of evidence was called as to the need for improved lighting facilities.

Mr. Vesey Knox, K.C., on behalf of the Ashington Coal Co., contended that the proposal was an unjustifiable scheme of municipal trading. The Northern Counties Electricity Supply Co. had spent £40,000 on distributing plant in the district, and since the Newcastle Electricity Co. had operated there had been an enormous improvement in the supply. If there was a loss on the gas undertaking, it meant that the Coal Co., who paid half the rates, would suffer considerable loss.

The preamble of the Bill was passed, subject to the approval of the Local Government Board to the borrowing powers.

Second and Third Readings.—In the House of Lords, on May 19th, the Hightown Gas and Electricity Bill passed its third reading. On May 20th the Norwich Electric Tramways Bill was read a second time.

In the House of Lords on Monday the Shropshire, Worcestershire and Staffordshire Electric Power Bill passed its third reading; also the Yorkshire Electric Power Bill.

In the House of Commons on Monday the North Metropolitan Electric Power Supply Bill passed second reading.

Newcastle Corporation Bill.—The Standing Orders Committee of the House of Lords has decided not to dispense with standing orders in regard to the application of the Corporation to insert a new clause in their Bill to allow them to run motor-'buses in the districts of Long Benton and Weetslade.

LEGAL.

Franco-British Electrical Co. *v.* Clifford Bros.

At the Bow County Court recently, plaintiffs were awarded £4 9s. 3d. in a claim for damages for breach of warranty against defendants, an East Ham firm. Plaintiffs ordered in 1912 certain electric time switches to automatically switch on and off current for electrical advertising signs, and they said that one of these, instead of turning off the light after six or seven hours, left the current on wasting during the hours of a sunny day. One witness said that the lights outside the Pavilion Theatre were on several occasions found burning in the morning. Eventually the apparatus was removed, and the fireman was paid to switch the light on and off. Mr. P. Clifford said that the plaintiffs were the only firm who had complained. He had supplied such switches to a number of electrical firms. It was some months after they had been fixed that the plaintiffs complained.

His Honour Judge Smyly said that it would take a certain time to find out whether the switch did what was required. He found for the plaintiffs for the amount named. Plaintiffs claimed £7 17s. 6d.

Godfrey *v.* Cox.

Mr. Muir Mackenzie one of the Official Referees of the High Courts, on Monday, May 25th, delivered judgment in this case, which was an action to recover £89 8s., balance of an account for electrical work done at the defendant's house, "Belmont," Streatham, by the plaintiff, Mr. Herbert James Godfrey, electrical engineer, of 188, High Road, Balham, and which was fully reported in our last issue. Mr. Godfrey, who had previously done electrical work for Mr. Cox, was approached by the defendant to do electrical work of various kinds in the house, including wiring, fitting and heating, the account for which originally amounted to £104 8s. The defendant, however, alleged that the work had been done negligently and improperly, and paid £38 8s. into Court. On behalf of the plaintiff it was contended that the work was done at "cut prices," but that it was nevertheless well done in accordance with the contract. On the other hand, the defendant alleged that the work was done negligently and improperly, and that he had had to get the defects remedied by another contractor.

Mr. Muir Mackenzie, in giving judgment, said that the contention of the defendant was that the contract was for certain work to be done for an agreed sum of money, and that as the work had not been done in accordance with the contract, nothing was recoverable. He (the Referee) found against this contention. The plaintiff, according to his case, completed his work, and was entitled to be paid, but the defendant denied that the work was of the best character. On this issue he found in favour of the defendant. The outside work was bad, and the inside work was also faulty, and it was the duty of the defendant, under the circumstances, to take such steps as were necessary to put himself in the position in which he would have been if the plaintiff had properly fulfilled his contract. He employed another firm to make good the installation. In this he (the Referee) found that the defendant had acted reasonably, and that the firm was not employed to do more work than was necessary. For this the defendant claimed £63, but he (the Referee) found that he was only entitled to recover £53 6s. The defendant had paid £38 8s. into Court, which was more than sufficient to cover the balance due from him. There would, therefore, be judgment for the defendant on the action, and for payment out of the balance. The costs would be for the defendant on the claim and the counter-claim.

Judgment was entered accordingly.

Marconi *v.* Helsby Wireless Telegraph Co.

The hearing of this action, which is to come before Mr. Justice Eve in the Chancery Division, has been fixed by his Lordship for Tuesday, June 23rd.

Venner's Signs *v.* Stellar Signs.

In the Chancery Division on Friday, before Mr. Justice Astbury, Mr. F. Russell, K.C., mentioned this case, which, he said, related to the infringement of a patent. It was not an ordinary case of infringement, but it was a rather serious case, in which an old employé of the plaintiffs was concerned.

Mr. Kerly, for the defendants, asked for an adjournment with a view to answering the evidence of the plaintiffs. He suggested that the motion should stand over till the second motion day of next sittings.

His Lordship said the motion would stand till Thursday (yesterday), and he would then consider whether it should stand over further.

Mr. Kerly said there was a good deal of evidence to consider.

The motion accordingly stood over till yesterday.

Osram Lamp Works, Ltd., *v.* Pope's Electric Lamp Co., Ltd.

In the Chancery Division on Tuesday, Mr. Justice Joyce heard a summons by the Osram Lamp Works, Ltd., for leave to deliver interrogatories to Pope's Electric Lamp Co., Ltd., with regard to the process of manufacture of certain filament lamps which were alleged to be an infringement of the plaintiffs' patent. The interrogatory which the defendants' objected to answer in its present form was as follows:—Whether the filaments of the said lamps are constructed by mixing tungsten of the same and what compounds thereof with some organic, and what organic binding medium, and whether or not it is then prepared in the form of filaments carbonised and by some and what method is the carbon removed.

Mr. J. Hunter Gray, for the Osram Lamp Co., said he wanted the information asked for in order that the defendants' process might be gone through and shown to be an infringement.

Mr. Clarke (for defendants): I can't be forced to tell what my process is.

Mr. Gray stated that what his clients did was to take tungsten and make it into a powder and mix it with some organic powder such as sugar to stick it temporarily together. Then it was squirted through a small hole to make the filament. Afterwards it was subjected to heat to reduce the sugar to carbon, and the carbon was removed chemically by steam and hydrogen at an even higher temperature. This produced a coherent wire of tungsten. Plaintiffs' patent covered the use of any organic binding medium, which was afterwards carbonised and had the carbon chemically removed.

Mr. Clarke said he would admit that the defendants used tungsten for their filaments, and that this was bound together with an organic medium, but afterwards the defendants' process was quite different to that of the plaintiffs.

In the end, his Lordship held that the plaintiffs were not entitled to all the information they asked for. It was really a general question: What is the mode you use? That would be inadmissible, and would be disallowed.

Leave to appeal was granted.

OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"Manager" writes:—"I should like to know the legal position of an electricity supply undertaking in the following instances:—

1. Due to a street improvement scheme a number of houses are being pulled down, necessitating the removal of the service cables. Can the electricity supply undertaking make a charge to the Corporation responsible for the carrying-out of the street improvement?

2. If a service is run into a building at the request of the tenant and with the permission of the landlord—the tenant afterwards removing and the property changing hands—the new landlord requires the service to be removed from his premises. Can the electricity supply undertaking legally make a charge for removing the service cable?

* * As to (1) provision is made by the 1899 Electric Lighting (Clauses) Act for the rights of undertakers whose property is affected by a street improvement. By Clause 17 of the Schedule to that Act, one month before any alterations are made in a street which would affect wires and lines notice of the proposed alterations must be served. Within three weeks after the service of any such notice and plan upon any owners those owners may, if they think fit, serve a requisition upon the operators requiring that any question in relation to the works or to compensation in respect thereof or any other question arising upon such notice or plan shall be settled by arbitration, and thereupon the question, unless settled by agreement, must be determined by arbitration. In settling any question under this section an arbitrator must have regard to any duties or obligations which the owners may be under in respect of the pipes, wires, electric lines, or works, and may, if he thinks fit, require the operators to execute any temporary or other works, so as to avoid interference with any purpose for which the pipes, wires, electric lines, or works are used, as far as possible.

As to (2) the remedy of undertakers who are called upon to remove service lines which are no longer in use must be pursued against those with whom they contracted. In the case referred to in the query, it is presumed that the away-going tenant will have complied with the terms of his contract to pay for a supply for a certain period. Having done that, unless there is a special clause to the contrary, the fittings, &c., become so vested in the owner of the premises, and attached thereto, that he can be compelled to pay the reasonable cost of their being removed. By Sec. 24 of the Electric Lighting Act, 1882, a power of entry is conferred, but it really depends upon the conditions under which they were first put in whether a charge for removing them can be made or not.

BUSINESS NOTES.

The Holidays.—The Great Eastern Railway Co. has issued an attractively illustrated quarto album of "East Coast Pictures" in connection with the earlier holiday movement. Copies can be obtained free from the Superintendent of the Line, Liverpool Street Station, London, E.C.

Catalogues and Lists.—Messrs. Carson & Evans, 3, Fenchurch Buildings, London, E.C.—New folder giving information, testimonials, &c., respecting Carvanite, the sales of which for the four months ended April, 1914, are reported as being eight times greater than for the corresponding period of 1913.

The Sterling Telephone and Electric Co., Ltd., 210-212, Tottenham Court Road, London, W.—Price leaflet particularising their new electric bell indicator for ships, lifts, hotels, &c.

Messrs. Feld Bros. & Co., Ltd., 25, Budge Row, London, E.C.—72-page catalogue, with information, illustrations and prices relating to special electrical apparatus and material for the construction and working of overhead travellers, cranes and other transport appliances. A separate album contains dimensional sketches corresponding to the articles described in the catalogue. The material has been standardised as far as possible by the firm, and the drawings are so arranged that they can be used as original tracings. This publication should be of interest to those engaged in connection with electric crane or conveying plant equipments; its usefulness will not be detracted from by such spelling as "swith-boxes," "pols" (for poles), "aplyable," "watertigth," and so on.

Messrs. J. H. Holmes & Co., Portland Road, Newcastle-on-Tyne.—Fourth edition of the mining section of their catalogue. It consists of 48 pages of half-tone pictures of power station plant, motors, pumps, haulage gear, oil switches, mining switch pillars, switchboards, controllers, &c.

The A.E.G. Electric Co., Ltd., 133-135, Oxford Street, London, W.—Book (222 pages) entitled "Electricity in the Home and Workshop" containing a great deal of information, together with prices and a number of interesting illustrations regarding the following matters:—Electric lighting with incandescent, arc and quartz lamps respectively, electric heating and cooking apparatus, electric fans, electric motors for household and industrial service, illumination and advertisement lighting, Christmas tree lighting, and electric clocks.

The company have also issued a large collection of illustrated and priced lists regarding a wide range of electrical goods, including fans, kettles, small motors, drills, grinders, lamps, wires, transmission fittings, electric refrigerators, and so forth.

The Sun Electrical Co., Ltd., 118 and 120, Charing Cross Road, London, W.C.—Three new lists for the trade. No. 255 describes the Sun switch-ceiling rose and pendants fitted with same; No. 256 illustrates and particularises the Lavigne electric unpickable lock, adapted for every possible requirement in door fastenings; and No. 257 deals similarly with a range of fittings for ¼-watt lamps for interior and exterior use.

Mr. E. C. Amos, 22, Martin's Lane, Cannon Street, London, E.C.—New 44-page catalogue containing fully illustrated particulars, with tabulated information concerning capacities, dimensions, weights, &c, of low-pressure centrifugal pumps made by Mr. A. Borsig, of Berlin, for whom he is British representative.

The National Cash Register Co., Ltd., 225, Tottenham Court Road, London, W.—A very interesting copy of the "N.C.R.," the firm's trade organ. It illustrates the development of the firm's cash registers, and also effectively shows what a great benefit has been conferred upon the human race by patented inventions.

Messrs. G. W. Goodchild & Macnab, 56-58, Eagle Street, Southampton Row, London, W.C.—Hanging wall chart setting out dimensions, weights, prices and code-words of their "Dekef" ball bearings—thrust, journal, and transmission shafting. Copies will be forwarded on application.

Messrs. Adnil Electric Co., Ltd., Artillery Lane, London, E.C.—Illustrated price-list (No. 127AE) giving full particulars of their standard type "G. F." direct-current interpole motors from 4 to 125 H.P., and dynamos from 3½ to 90 KW.

The Power Plant Co., Ltd., West Drayton, Middlesex.—List No. 9 contains illustrations and description of their double-helical gearing for machine tool drives; No. 10 deals with double-helical spur gears for automobiles, &c.

Messrs. Crompton & Co., Ltd., Chelmsford.—New leaflet No. 537, describing their cell-testing voltmeter, and giving prices of same.

Rhadoonit.—The makers of "Rhadoonit" inform us that as a result of their advertisement in the ELECTRICAL REVIEW, they have received inquiries from nearly every country of any importance in the world, including the British Colonies and Dominions, but excepting, of course, certain European States where requirements are catered for direct from the works of the makers in Germany. Mr. C. A. Muller, of 10, Arcade, Westgate, Bradford, the sole agent for the United Kingdom, states that the works have now eliminated the inability of Rhadoonit to withstand immersion in oil and its tendency to soften under sustained high temperature.

A G.E.C. Advertising Campaign.—THE GENERAL ELECTRIC CO., LTD., of 67, Queen Victoria Street, E.C., have made arrangements whereby electricians, ironmongers, &c., can supply "Magnet" domestic irons for 15 days' free trial—this with a view to popularising "other uses" of electricity where electric lighting is in vogue. In this connection a small 32-page booklet has been issued by the company, which not only deals with the price and cost of using electric irons, but also with a complete range of domestic electric accessories.

Book Notices.—*Ornamental Lathe-Work for Amateurs.* By C. H. C. London: Percival Marshall & Co. Price 3s. 6d. net. —Many engineers are fond of the workshop, not only for commercial reasons, but also for the sake of the recreation it affords in leisure hours. To such this book should prove a valuable guide, as it opens the way to the practice of an art that offers possibilities of infinite diversity. Not only does the author embody in its pages the fruits of his own experience as a craftsman, he also gives particulars of prices and sources of materials, information which is often difficult to secure. The author, who reproduces views of many beautiful things that he has made, states that they were all produced within about nine months, and that he made all his own apparatus. The book is full of useful hints, with illustrations far above the average, and we have no hesitation in recommending it.

The Engineering Index Annual, 1913. New York: Engineering Magazine Co.—This is the twelfth volume of the Index, and, like its predecessors, is heartily welcome; we have so often expressed our appreciation of its contents and of the skill with which they are compiled and classified, that we are somewhat at a loss for new encomiums wherewith to sound its praises. The Index covers some 250 publications, of which, it is interesting to note, three-fourths are printed in English—such is the dominance of our tongue. As an aid to rapid search for references to published articles on any subject of engineering interest, it remains unrivalled.

The Municipal Year Book for 1914. London: Municipal Journal, Ltd. Price 15s. net. This volume has grown in size and increased in usefulness as the years have passed, and the edition now before us impresses one with the extent and importance of the undertakings and operations conducted to-day by municipal departments. In the upkeep and extension of their various undertakings, municipalities are large customers for all kinds of manufactures, and that fact alone makes such a work as this practically indispensable to those concerned with industry and trade; but there are many others also who in public and professional life are frequently requiring information such as a book of this nature is able to give in its numerous sections. The members of the different councils in England, Wales, Scotland and Ireland and their chief officers, and information regarding the cities, boroughs, &c., for which they act, form by no means the least useful section, and in later parts there are given tabulated statistics of electricity supply and tramway undertakings with detailed analyses of accounts; water and gas undertakings are also covered, and in the present edition there is a new section, which is likely to grow, relating to motors in municipal service. Other important sections deal with education, town-planning, and the housing of the working classes refuse disposal, baths and wash-houses, protection from fire, old-age pensions, a digest of legal cases, a summary of legislation of 1913, municipal debt and assets, local taxation returns, tramway-men's wages and hours of labour. Mr. Robert Donald is director of the *Year Book*, and Mr. Albert E. Cave is its editor.

British Trade with Canada.—A few months ago (ELECTRICAL REVIEW, December 12th, 1913) we gave particulars of the scheme for sending a British train across Canada for advertising and pushing the sale of British manufactures. The Canadian Chamber of Commerce (Oxford Court, Cannon Street, E.C.), which is organising the scheme is at present conducting a Canadian trade campaign, in order to secure collective action at the earliest possible date on the part of British firms anxious to secure an increased proportion of Canadian import trade. It is trying to strengthen the British Manufacturers' Section of the Chamber by the addition of further representative firms and the subscription of a Canadian Trade Fund. The fund will be devoted to a year's campaign sending special commercial commissioners to Canada to report upon the problems of the market considered from the British standpoint. These commissioners, it is suggested, will act under the advice of, and in consultation with, Mr. C. Hamilton Wickes, H.M. Trade Commissioner in Canada. In the preliminary list of members in the British Section we observe the names of several well-known electrical manufacturers. The Secretary of the Chamber will be glad to give the fullest information available to any British firm.

At the London Chamber of Commerce last week Mr. Hamilton Wickes, who in his capacity as our Trade Commissioner in Canada, has already had abundant opportunities for studying the Canadian market from the British point of view, gave an instructive address to a fairly good gathering of City men. He began by giving figures to show that £76,000,000 of the gross imports into Canada were open to the British manufacturer or trader. In the Board of Trade report shortly to be issued that £76,000,000 was analysed showing the extent of the possibilities for particular trades. We were dealing with a market all along the border of which we had a powerful competitor, and we lacked an Anglo-Canadian merchant organisation. A number of criticisms were offered of British methods. Ordinary English yards and inches were used, and it was a land of dollars and cents, and English firms should remember these points in sending catalogues. The United States had the advantage that its currency was the same as the Canadian. In respect to delivery, the States possessed little or no advantage over the Britisher. Time was, of course, lost if there was correspondence Home and back. Canadian firms objected when, after giving an order for goods, they got an invoice by return and had to wait two or three months for their goods. This was particularly noticeable in hardware. It was a mistake to think that a method of business which had succeeded in Australia could necessarily be applied with equal success in all the rest of the world. One Continental organisation that he had met both in Australia and in Canada did not invoice the buyer until the goods were landed in Canada. The Canadians swore that this was the way things should be done. It was bringing things into line with the practice of the U.S. manufacturers on the South side. British firms said that they could not find suitable agents in Canada, but Mr. Wickes said that they did not realise the expense and the currency, and did not give favourable terms. It was said that the range of British goods was not wide enough to bear the expense of the travelling—they could not pay enough to have the territory properly covered, but Mr. Wickes advocated the formation of groups of manufacturers of similar articles—not identical lines—who would have one agent. That was the only way in which the cost could be sufficiently reduced to pay the different concerns interested. The main difficulty that our firms had to get over was to learn the habit of distributing. Mr. Wickes wondered why the trading community here as a whole took so little interest in the Trade Commissioners and the Board of Trade Commercial Department. "We have to carry the information to you, and in many cases force it down your throats." Why, when firms sent representatives to Canada, did those representatives not call and secure the invaluable information that the Trade Commissioner could put at their disposal? "Why does the Press boycott the Trade Commissioner and the Commercial Intelligence Department of the Board of Trade and their attempts to help the commercial community?"

In the course of a brief but interesting discussion which followed, several speakers spoke very highly of the assistance that they had received from the lecturer of the afternoon in trying to extend their trade relations both in Australia and in Canada.

"Metroflam" Lamps.—The Newcastle-on-Tyne Corporation has just placed a further repeat order with MESSRS. JOHNSON AND PHILLIPS, LTD., with 40 long-burning "Metroflam" lamps, bringing the total number installed up to 130. Repeat orders for these lamps have also recently been received from the Glasgow, Blackpool, Southend, South Shields and Willesden lighting authorities.

Bankruptcy Proceedings.—W. R. WEDGE, electrical engineer, The Arcade, Northampton.—The adjourned public examination of this debtor was to have been held at the County Hall, Northampton, on May 19th, but when the case was called, the Official Receiver, Mr. A. Ewen, stated that he had received a letter from the debtor, stating that whilst at work he had met with an accident. Debtor did not think it was a serious matter, but the doctor had said it was. The letter was accompanied by a doctor's certificate. The Official Receiver applied for a further adjournment, and the case was, therefore, again adjourned.

L. J. ARON, engineer, 7, Harpur Street, Bloomsbury, W.C.—Receiving order made May 18th, on creditors' petition. First meeting June 3rd. Public examination July 1st, both at Carey Street, W.C.

JAS. BROCKIE, mechanical engineer, 41, London Road, Forest Hill, S.E.—Last day for proofs for dividend June 7th; trustee, Mr. M. W. W. Mackie, 47½, Old Street, E.C.

WILLIAM HENRY PEASE, electrical engineer, 19, Princess Royal Terrace, Scarborough, York, late Royal Hotel Shops, Scarborough, and 19 and 20, Baxter Gate, Doncaster, York. The following are creditors herein:—

General Electric Co.	£145	Postmaster-General	£14
Pease, Mrs. W.	152	Barlow & Co.	21
Pease, Miss E.	70	Joyner & Co.	22
Gent & Sons, Ltd.	37	Steel Conduits & Fittings	14
Johnson & Phillips	22	Tonks, J., & Sons	26
Brimsdown Lamp Co.	23	Eldridge & Morris	35
Adnil Electric Co.	15	"Bankers"	21
London Electric Warehouse	18	Appleyard, Arthur	18
Hallamshire Electric Co.	14		

WILLIAM WALKER, lately carrying on business at 2-3, Red Lion Court, Fleet Street, E.C., as "David Smith & Co.," dealers in electric lamps.—At a sitting of the London Bankruptcy Court, held on Tuesday, before Mr. Registrar Linklater, this public examination was held. The statement of affairs showed liabilities £968 10s. and assets "nil." Replying to Mr. Egerton S. Grey, Official Receiver, the debtor stated that he was born in New Zealand and came to this country in 1908. Until July, 1911, he was in employment, but then commenced business on his own account as above, with a capital of £28, his own money. He subsequently borrowed £762 from his wife, and the whole of that money was lost in the business, which was to exploit lamps manufactured in Dresden, Vienna and Paris. It was carried on until 1912; the petitioning creditors, who were the Osram Lamp Works, Ltd., then obtained

an interlocutory injunction restraining him from selling any lamp manufactured with a squirted filament. They wanted him to enter into an agreement not to sell any lamp manufactured by people other than themselves and two other firms. That he refused to do, and the Osram Co. proceeded with their injunction, and obtained judgment for the costs of the action. Witness was unable to pay the bill, and these bankruptcy proceedings ensued. The business was closed in December, 1912, and witness had since been employed as managing director of a company. He attributed his failure and insolvency to the costs of litigation. The books were destroyed when the business was closed. The examination was concluded.

Trade Announcements.—THE BRUSH ELECTRICAL ENGINEERING CO., LTD., has issued a notice to the effect that the business of the electrical supplies department of the company, trading under the name of the London Electric Warehouse Co., Manners Street, York Road, London, S.E., has been taken over as and from April 1st last by the Anglo-Colonial Engineering Co., Ltd., 13, City Road, London, E.C. The Anglo-Colonial Co. will assume responsibility for all receipts and payments. The managing director of the company will be Mr. P. J. White (late general manager of the London Electric Warehouse Co.), and it is its intention to specialise in everything electrical.

MESSRS. PEARSON & CO., dealers in E.L. fittings, of 31, Cornmarket, Oxford, are removing to new premises at 19-23, George Street.

Liquidations.—THE NATIONAL TELEPHONE CO., LTD.—A meeting will be held at Hamilton House, Temple Avenue, E.C., on June 25th, to hear an account of the winding up from the liquidator, Mr. G. Franklin.

THE GRINDELL-MATTHEWS WIRELESS TELEPHONE SYNDICATE, LTD.—Mr. H. W. Kirby, of Basieshaw House, Basinghall Street, E.C., has been appointed liquidator (with a committee of inspection) in the compulsory winding up of this company.

THE DE FOREST WIRELESS TELEGRAPH SYNDICATE, LTD.—A meeting will be held at the offices of Messrs. Allen Attfield & Co., 147, Leadenhall Street, E.C., on June 29th, to hear an account of the winding up from the liquidator, Mr. S. J. Ashby.

Canada.—The Imperial Trade Correspondent at Toronto (Mr. F. W. Field) reports that an electrical and mechanical engineer, with a good connection throughout Canada, wishes to get into touch with United Kingdom electrical and mechanical engineering firms desirous of transacting business in Canada. Information may be obtained at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

Meter Approved.—The B. of T. has approved of the Ferranti polyphase watt-hour meter, type C.T., deposited by MESSRS. FERRANTI, LTD., in February, 1913.

LIGHTING and POWER NOTES.

Aberystwyth.—STREET LIGHTING.—The T.C. has decided to consult an expert on the question of lighting portions of the town by electricity. Part of the district is already lighted by electricity by the Chiswick E.S. Corporation, which has been asked to suggest a scheme by which a better light could be obtained from current at present used.

Accrington.—ANNUAL ACCOUNTS.—The revenue of the Corporation electricity undertaking for the past year amounted to £27,678, the working expenses to £17,979; and after meeting capital charges a net surplus of £677 remained, as compared with £2,323 in the previous year. The units sold amounted to 5,856,030, as against 4,836,024 in 1912-13, and included 435,000 sold in bulk to Haslingden. The total cost per unit amounted to 1·107d., and there were 1,136 consumers. The bulk of the energy is generated by gas engines operating in conjunction with a by-product plant, and it is somewhat noticeable that the revenue received from by-products (sulphate of ammonia and tar), was over £500 in excess of the revenue received from the Haslingden supply mentioned above.

Argentina.—The Minister of Public Works of the Province of Mendoza has been requested by the representative of the Argentine Power and Railless Traction Co. to ask the Government to declare as lapsed the concession for electric light, power and tramways in the city and suburbs of Mendoza, granted to the Compania Luz y Fuerza. The company, which has been working the concession for two years, has a capital of $1,000,000 gold in bonds, which, together with $850,000 in shares, is held by the Compania Alemana Transatlantica de Electricidad, and about $4,500,000 paper, has been advanced by the parent company, the Deutsche Ueberseeische Elektrizitäts Ges., so that the capital invested in the Mendoza undertaking is about $7,000,000. A new hydro-electric station, with a capacity of 12,000 H.P., is at present being constructed for the company by the Compania General de Obras Publicas.

The Isla Syndicate, which holds a concession for the use of the waters of the San Juan River, has deposited $100 000 in guarantee of fulfilment of its concession. This has been transferred to the Central Argentine Electric Light, Power and Tramways Co., which has been registered with a capital of £450,000. The engineers entrusted with the works are Messrs. Dick, Kerr & Co.—*Review of the River Plate.*

Aughton (near Ormskirk).—PROPOSED E.L.—The Parochial Committee has agreed to receive a deputation on the question of an electricity supply for the district.

Bacup.—At a conference between representatives of the Bacup and Rawtenstall T.C.'s it was decided that the present agreement is to be terminated, and that the whole question of the management of the electricity undertaking shall be reconsidered.

Bailieborough (Co. Cavan).—E.L. SCHEME.—Mr. John W. M'Keever, of Ardee, has submitted an E.L. scheme for the towns of Bailieborough, Shercock, Mullagh and Kingscourt to the Bailieborough B. of G., and a special meeting of the board has been arranged to discuss the matter.

Barnes.—VEHICLE BATTERY CHARGING.—The U.D.C. has resolved to charge 1d. per unit for charging electric battery vehicles during times other than peak-load hours, 1½d. per unit during peak-load hours, and ¾d. per unit between 11 p.m. and 6 a.m., with a minimum charge of 2s. for one charging operation. In future all large consumers of current for heating and power are to be supplied at 1½d. per unit, less 33⅓ per cent. discount.

Barrow-in-Furness.—YEAR'S WORKING.—During the last year the revenue of the Corporation electricity department increased from £17,524 to £20,149, and working expenses from £9,250 to £11,460. The net profits decreased from £702 to £513. The units sold totalled 2,081,317, an increase of 21 per cent.

The Electricity Committee has decided to charge 1d. per unit for current for charging electric battery vehicles at other than peak-load hours.

Basingstoke.—LOAN REQUIREMENTS.—The B.C. has resolved to borrow £14,000 for electricity purposes; also to purchase the necessary columns, brackets and fittings for electrical street lighting.

It has been decided to charge 5d. and 4½d. per unit for lighting, 3¾d. per unit for outside shop lighting, and from 2d. to 1½d. per unit for power purposes.

Bexhill.—YEAR'S WORKING.—The gross profit of the electricity department for the year ended March 31st last, was £6,524, compared with £6,173 in 1913. The net profit was £1,817, against £1,276, and has been carried forward.

Bootle.—L.G.B. INQUIRY.—Mr. T. C. Ekin held an unopposed inquiry last week into the application of the T.C. for sanction to borrow £19,312 for the extension of the electricity undertaking, including a new generating station, a sub-station, mains and services.

Bury.—RATE RELIEF.—The Electricity Committee has decided that out of its profit of £2,185, £1,000 shall be paid to the relief of the rates, and the balance to the reserve fund.

Cleethorpes.—PROPOSED LOAN.—The U.D.C. is applying to the L.G.B. for sanction to a loan of £10,000 for the extension of the electricity undertaking.

Colwyn Bay.—YEAR'S WORKING.—There was a gross profit of £3,836, and a net profit of £1,168, on the past year's working of the electricity undertaking.

Connah's Quay.—L.G.B. INQUIRY.—An inquiry was held on May 22nd into the application of the U.D.C. for a loan for carrying out an electric light scheme.

Continental Notes.—SICILY.—La Société d'Electricité de la Sicile Orientale, which is now supplying current to 15,619 clients, has decided to establish a steam-operated generating station at Catania, to act as a reserve to the water-power plants.

GERMANY.—The Bergische Licht, Kraft und Wasserwerk Ges. is the name of a new concern formed to acquire the municipal gas and electric lighting undertakings in the town of Bergisch-Gladbach, and the concession for the electric lighting of Bensberg.

Cowbridge and Penybont.—The B. of T. has issued an order empowering the South Wales E.P.D. Co. to supply electricity in the borough of Cowbridge, six parishes in the area of the Penybont R.D.C., 27 parishes in the area of the Cowbridge R.D.C., and a portion of the parish of Llantrisant.

Croydon.—YEAR'S WORKING.—The net surplus on the electricity undertaking for the past year amounted to £1,877, which with other amounts left £2,284 to be carried forward. The reserve fund from which £6,559 was taken during the year for new turbine plant and the sinking of an artesian well, had a balance of £26,494, and it has been agreed to transfer the surplus, £2,284, to this fund.

The engineer (Mr. A. C. Cramb) reports a considerable increase in electrical cooking and heating, and urges that steps be taken to obtain powers for hiring out the necessary apparatus or installing it on the hire-purchase terms. The units sold show an increase of 733,355 on the year, during which reductions in price were made equivalent to £1,000 to the tramways department and to £800 for public lighting service.

LOAN SANCTION.—The L.G.B. has sanctioned a loan by the T.C. of £9,500 for new electricity mains, and £500 for sub-stations.

Cranbrook.—E.L. SCHEME.—The Joint Committee of the P.C. and the R.D.C. on May 20th discussed the E.L. scheme proposed by Messrs. Saunders & Co., of Westminster. A parish meeting recently voted in favour of the scheme, but objections have now been received to the use of overhead wires. By the casting vote of the chairman, a resolution was passed to the effect that, whilst not averse to the scheme, the Joint Committee strongly deprecated the use of overhead wires.

Dinas Powis.—PROPOSED E.L.—The St. Andrew's P.C. has decided to consider the question of E.L. in the parish, on account of its treatment by the Barry Gas Committee.

Enniscorthy.—PROPOSED E.L. SCHEME.—The U.D.C. has decided to take steps to start an electricity undertaking in the town; a report by Mr. Harris, of Dublin, estimated the cost of a scheme at £4,632, the annual revenue at £1,507, and the working costs at £752. Information is to be obtained from similar towns which have adopted electric lighting.

Falkirk.—PLANT EXTENSIONS.—The T.C. has decided to install another battery at the electricity works, at an estimated cost of £4,750, and to extend the switchboard, at an estimated cost of £1,000.

Frinton-on-Sea.—PROPOSED PROMENADE LIGHTING.—The E.L. Co. has submitted to the U.D.C. proposals for lighting the sea-wall promenade, and for the supply of current to the occupiers of huts for heating purposes. The Council has requested full particulars of the scheme.

Greenock.—PROPOSED LOAN.—The T.C. has decided to apply to the Secretary for Scotland for power to borrow an additional £30,000, to meet the cost of extensions at the electricity works. The output of the department for power and light during April showed a decrease of 47,000 units compared with April of last year.

Hessle.—PROPOSED E.L.—The Hull T.C. has decided to issue the necessary notices for supplying electricity to Hessle. The heads of agreement with the U.D.C. have been settled, and the question of Hull paying Hessle £462, expended in obtaining the prov. order, has been waived.

Huddersfield.—LOAN SANCTION.—The Electricity Committee has received the sanction of the L.G.B. to borrow £21,500; sanction has now been obtained to the borrowing of £52,000 out of £62,000 applied for.

India.—STREET LIGHTING.—In order to compare the respective merits of electric and gas lighting, the Municipal Commissioner has arranged with the Bombay E.S. and Tramways Co. and the Bombay Gas Co. to carry out experiments in several streets of the city.

The Simla Municipality has applied for a loan of Rs. 2,75,000, for the first extension of its hydro-electric scheme.—*Indian Textile Journal.*

Keighley.—PROV. ORDER.—The R.D.C. has agreed to support an application by the Keighley Corporation for a prov. order to supply electricity to Steeton and Morton Banks, the former relating to the lighting of the main road. The Corporation has also been permitted to canvass the residents of Morton Banks, to ascertain the probable demand.

Leeds.—L.G.B. INQUIRY.—Mr. T. C. Ekin last week held inquiries into the application of the T.C. for sanction to borrow £212,000 for extension of the electricity undertaking, and £17,600 for the purchase of the undertaking of the Roundhay and District Electric Lighting Co. The price to be paid for the latter was the amount of the preference and ordinary share capital in the company, £12,390, with interest on the ordinary share capital at the rate of £3 2s. 4d. per cent.

Limerick.—YEAR'S WORKING.—The net profit on the Council's electricity undertaking for the past year amounted to £181.

Lisnaskea.—PROPOSED E.L.—The R.D.C. has been informed by the L.G.B. that as objections have been made to the E.L. scheme for the town, an inquiry will be held at an early date.

Llanfair Caereinion (Montgomeryshire).—E.L. SCHEME.—An E.L. scheme for the town has been put in hand, and is to be completed by the end of October. Power is to be obtained from the River Banwy.

London.—The L.C.C. has been recommended by its Finance Committee to grant the following loans for electricity purposes:—Fulham B.C., £5,000, including £4,590 for mains, and £410 for plant; Shoreditch B.C., £11,073, including £5,745 for land, £2,142 for mains, £1,916 for services, and £1,270 for meters; Southwark B.C., £10,087, including £7,055 for mains, £1,867 for machinery, £1,040 for services, and £125 for meters; all these loans have been sanctioned.

The Finance Committee has also recommended the Council to sanction the following loans for electricity purposes:—Poplar B.C., £5,000 for a site for coal storage; Shoreditch B.C., £11,481, including £5,000 for mains, and £6,481 for plant.

HACKNEY.—The B.C. has decided to take up a loan of £16,350 for electricity purposes, which has been sanctioned by the L.C.C.

WESTMINSTER.—The City Council is recommended to continue, for a further 12 months, its contracts with the Charing Cross, West End and City E.S. Co., the Metropolitan E.S. Co., and the St. James' and Pall Mall E.L. Co., for the supply of electricity to the Council's buildings.

Hayle.—STREET LIGHTING.—The U.D.C. has decided to ascertain the cost of a public lighting installation by electricity, and the annual charge, based on the existing 61 lamps, for maintenance.

Middlesbrough.—YEAR'S WORKING.—The net profit of the Corporation electricity department during the past year was over £4,000, an increase of £2,278 on the previous year.

Middleton.—YEAR'S WORKING.—There was a deficit of £640 on the past year's working of the electricity undertaking.

Morecambe.—The T.C. has received the draft consent of the B. of T. to supply electricity to premises in Heysham.

New Zealand.—The new 9,000-H.P. hydro-electric station of the Waihi Gold Mining Co., which is the largest in Australasia, has recently been put into operation. The power-house is at Hora Hora Falls, on the Waikato River, and the plant consists of six turbines of the Francis type, built by Jens Orten-Boving & Co., each of 1,500 B.H.P. capacity at 187 R.P.M., direct-coupled to a 1,050-KW. Siemens three-phase, 5,000 volt, 50-cycle alternator. The pressure is stepped up to 50,000 volts for transmission to Waikino, 44 miles distant, the transmission line with steel towers and three copper wires, passing over the Te Aroha ranges, rising to a height of 2,500 ft. Normal spans are 480 ft., and the maximum about 1,300 ft. At Waikino, the pressure is stepped down to 11,000 volts for transmission 5½ miles to Waihi, and a portion is used locally at 500 volts in the company's 200-stamp battery. At the mine the motors are supplied at 2,000 volts. Some 30 motors have been installed for all classes of work, and the company has the right to supply local authorities on the route in bulk, for distribution purposes.

Nottingham.—YEAR'S WORKING.—The revenue for the past year of the Corporation electricity department amounted to £96,818, and the expenditure to £56,713; of the balance, after meeting capital charges, £8,000 was allocated to the relief of the rates, and £4,471 to the reserve fund.

Oldham.—YEAR'S WORKING.—The net profit on the Council's electricity undertaking for the year ended March 25th last, was £1,994, compared with £1,044 in the previous year. The power load increased by 42 per cent. during the year, and lighting load by 17 per cent.

Paisley.—STREET LIGHTING.—It is understood that a Sub-Committee of the T.C. is considering an important scheme for the extension of the electric lighting system. The scheme generally is to light the main thoroughfares from the present terminals to the burgh boundaries, and, as the existing cables are inadequate, the scheme would necessitate new cables throughout the town, which may possibly be laid in duplicate, so that every alternate lamp could be switched off at midnight.

Peru.—The Cerro de Pasco Mining Co., which owns large copper and coal mines in the State of Junin, has just completed a large hydro-electric plant. The power is obtained from the river Yauli, near Pachachaca, and conveyed by a canal, about 10½ miles long, to the power station at Oroya. It is stated that from 12,000 to 14,000 H.P. is available.

Portsmouth.—YEAR'S WORKING.—The past year's working of the Corporation electricity department resulted in a net profit of £4,364, of which it is proposed to allocate £3,000 to the relief of the rates, and £1,000 to reserve.

Reading.—BULK SUPPLY.—The B. of T. has granted the Reading E.S. Co. permission to supply electricity in bulk to the York Town and Blackwater Gas Co.

Richmond (Surrey).—STREET LIGHTING.—The T.C. has granted permission for the Richmond E.L. and P. Co. to install electric lighting in the Crescent, Kew Road, Sheen Road and Bridge Street, as an experiment.

Salford.—PROBABLE EXTENSIONS.—It is anticipated that the Electricity Committee will need to take steps in the near future to cope with the increasing demand for current. Several firms have intimated that they will require additional supplies before long.

Sedgefield.—STREET LIGHTING.—The R.D.C. has given the Trimdon P.C. permission to erect overhead wires for electrical street lighting at Trimdon Grange and Trimdon Colliery. The work is being carried out by Messrs. Reed, Ferens and Co., and current is to be supplied by Messrs. Walter Scott, Ltd.

Southport.—NEW CHARGES.—The T.C. has recently adopted the following method of charging for electricity:—To business premises, according to the maximum load demanded, plus ¾d. per unit; private houses, at a fixed charge based on the gross rental, plus ¾d. per unit.

Stirling.—LOAN SANCTION.—The T.C. has received sanction to the borrowing of £3,000 for electricity purposes. In granting the application, the Secretary for Scotland pointed out that attention should be given to the building up of an adequate reserve fund.

Swindon.—Subject to a seven years' contract, the T.C. has decided to supply electricity, on arranged terms, for lighting and power to the new factory of the Imperial Tobacco Co.

Tilbury Docks.—The Port of London Authority has authorised the installation of electric accumulators at the Docks, at an outlay of £5,500, for the working of a series of electric cranes.

U.S.A.—Half-watt Lamps.—The electrical department of the Sanitary District of Chicago has decided to use 2,000 half-watt lamps, in 300 and 500-watt sizes, for street lighting. They will be operated on straight-series arc A.C. circuits from compensators giving 20 amperes in the secondary. The makers guarantee 1,350 hours' life; and as the result of tests it has been found practicable to operate mixed circuits with flame arcs.

The electors of Los Angeles have voted in favour of the issue of bonds of 6¼ million dollars for the completion of the hydro-electric generating plant, and the construction or acquisition of an electric distributing system. The three electric companies in the city have energetically opposed the municipal scheme, and have offered to purchase the energy for resale in the city at a price fixed by the city authorities.—*Elec. World.*

TRAMWAY and RAILWAY NOTES.

Ardsley.—Railless Traction.—The B. of T. has sanctioned the borrowing by the Council of £4,000 for the railless traction system.

Baildon.—Proposed Loan.—The U.D.C. has decided to apply to the L.G.B. for sanction to borrow £21,800, for the construction of tramways.

Birmingham.—First-Class Tramcars Abandoned.—The service of first-class cars in Hagley Road has proved a failure, and has been withdrawn. The inside fares were doubled, while outside they were as usual, but it was found that only a small percentage of passengers paid the increased fares.

Bristol.—Proposed Tramways Purchase.—Reports have been prepared by Mr. J. B. Hamilton, manager of the Leeds city tramways, and Mr. J. F. C. Snell, jointly, and by Mr. J. M. McElroy, manager of the Manchester city tramways, concerning the proposed purchase by the T.C. of 25 miles of tramways belonging to the Bristol Tramways and Carriage Co., upon which the Council has an option of purchase on May 1st, 1915. Messrs. Hamilton and Snell state that the company refused "at present" to supply information or to allow an inspection of the undertaking, and their estimates have, therefore, been compiled from descriptions in the technical Press, civic data, the examination of the workings of the undertaking which were available to all, and from experience elsewhere. The 25 miles of tramway, including the power station and all depôts, are valued at £600,000, and the net surplus available on a year's working by the Council is estimated at £37,073, which could be easily increased. Longer penny stages divided into halfpenny stages are recommended. The reporters do not agree that tramways are becoming an obsolete type of conveyance, and state that the substitution of a motor-'bus service in Bristol would cost £78,872 per annum more than the tramways. Railless electric traction is not favoured for general use, and the report is in favour of the purchase of the undertaking by the Council.

Mr. McElroy's report is also strongly in favour of municipal purchase, and states that tramways on the overhead system have not been threatened by other systems of traction. He also thinks that the fares are too high. Messrs. Hamilton and Snell state that there is scope for several new routes in Bristol, and also for railless traction services.

On Tuesday last the City Council considered the purchase not only of the option lines, but also of the outlying sections, which, under a clause inserted in the Bill, has been made compulsory. Mr. J. Littleton, an accountant, criticised the experts' figures, and contended that the basis of 6·04d. as the working costs per car-mile was wrong, and that it should be at least 8·36d. He stated that the purchase would involve the Council in a loss. The Council, without a division, approved a resolution which virtually pledges it to purchase if the decision is confirmed by a poll of the electors.

Continental Notes.—France.—From the report of the Paris Metropolitan Railway Co. for 1913, which has just been issued, we learn that a new power supply sub-station, known as the Auteuil, was put in operation in September last. At the Republique and Motte-Picquet sub-stations two new 1,500-KW. transformers were added to each, while one of similar capacity was installed at the Denfert-Rochereau sub-station. At the Bercy power station a new 1,500-KW. alternator—making the eighth—has been put down to replace an old continuous-current set. Seventy new motor coaches and 64 trailers were added to the rolling stock during the year, and 108 of the first category and 21 of the second have been ordered for the new lines approaching completion.

The Société des Chemins de Fer Economiques du Nord, which owns three steam railways in the Upper Savoy Department, has secured Government authority to convert them to electric traction. It has also secured a concession for the construction of two local electric railways, one from Samoens to Sixt, and one from Pont de Fillinges to Habere-Poche.

A concession has been granted for the construction of electric tramways between St. Germain-en-Laye and Argenteuil, and between St. Germain-en-Laye and Maisons-Laffitte.

Russia.—The Council of Ministers has approved the raising by the town of Vilna of a loan of about £427,000 for the installation of an electric tramway in the city. The loan has not yet received Imperial sanction.

Switzerland.—An 80-year concession has been awarded to a syndicate represented by M. le Dr. E. Mory, of Adelboden, and M. R. Zehnder-Spörry, for the construction of a narrow-gauge electric railway from Frutigen to La Lenk, *viâ* Adelboden. The line has to be ready for working within 30 months from the date of commencement. The cost of construction is estimated at £200,000.

Italy.—The Municipal Tramway Board of Turin has been authorised to construct an electric tramway from that city to Monte Rosa.

Croydon. — Estimates, 1914-15. — The estimated receipts of the tramways undertaking for next year are £90,171, and working expenses are expected to amount to £71,589, leaving a gross balance of £18,582, reduced to £2,017 after meeting capital charges, &c. It was pointed out that the figures were speculative, but the receipts had lately been improving.

Dundee.—Year's Working.—The total revenue of the T.C. tramways department for the past year amounted to approximately £69,475, an increase of £4,431 on the previous year.

Exeter.—Year's Working.—The revenue of the T.C. tramways department for the past year amounted to £17,489. The net surplus was £1,724, and has been carried to the reserve and renewals fund, which now stands at £7,833.

Huddersfield.—Year's Working.—The total income of the T.C. tramways department for the past year was £116,320, an increase over the previous year of £6,611, and an average of 11·54d. per car-mile. The total working expenditure was £70,971, or 6·92d. per car-mile. The net profit was £8,800, of which £6,662 has been applied to the relief of the rates.

The B. of T. has consented to the doubling of the tramway track in Leeds Road North.

Japan.—The Imperial Railway Board has granted concessions for the construction of the following electric railways:—Ikegami Electric Railway Co. (6·32 miles); Tamba Electric Railway Co. (5·5 miles); Nagoya Electric Railway Co. (2·7 miles); and the Ama Electric Railway Co. (4 miles).

Leeds.—Proposed New Cars.—The Tramways Committee has recommended the T.C. to ask the B. of T. to sanction the borrowing of £22,500 for the provision of 25 new tramway cars. It is estimated that between 50 and 70 will be required in the near future. About half the cars will be built by the Corporation, and the remainder will be bought from private contractors.

Leicester.—Proposed Tramway Extensions.—The Tramways and Electricity Committee has recommended the T.C. to construct a tramway from Aylestone Road *viâ* Welford Road to Clarendon Park Road, at an estimated cost of £19,954.

London.—Hackney.—The Electricity Committee has recommended a charge of 1d. per unit for energy for charging electric vehicle batteries during unrestricted hours, and 3½d. per unit during restricted hours.

Manchester.—Annual Report.—The annual report of the Corporation tramways department states that during 1913 four new routes were opened, bringing the aggregate length of single track open for traffic on March 31st last, including lines over which the T.C. had running powers, to 194½ miles. The revenue amounted to £925,310, and working expenses to £585,224. Including bank interest, £13,594, the gross profit for the year was £353,610. The net profit was £200,309, of which £97,219 has been placed to the reserve, renewals and depreciation account, and £100,000 to the relief of the rates. The revenue per car-mile was 11·410d., against 11·351d. in the previous year. Working expenses were 7·216d. per car-mile, against 7·132d. There were 1,303,353 parcels carried, against 1,189,143. The total profit in this department was £3,642. There are now 662 tramcars in stock. The passengers carried exceeded 205,000,000, an increase of 17,933,558.

Nottingham.—Year's Working.—The total revenue of the Corporation tramways undertaking for the year ended March 31st last amounted to £175,329, an increase of £8,218 over the previous year. Working expenses amounted to £108,422, and of the surplus £7,013 has been placed to the reserve and renewals fund, £34,340 to capital charges, and £24,000 in aid of the rates. The energy consumed amounted to 5,359,804 units, a decrease of 401,292 units. The car-mileage was 3,524,621, an increase of 38,831, and the Notts. and Derby Co.'s cars also ran 19,000 miles in the city. Passengers carried numbered 40,410,404, an increase of 1,926,322, while the company's cars also carried 125,000 passengers.

Stirling.— PROPOSED TRAMWAYS PURCHASE.— The Stirling and Bridge of Allan Tramways Co. has intimated its willingness to sell its undertaking to the T.C., but it prefers that the T.C. should first come to terms with the Bridge of Allan T.C. and the County Council, and afterwards come to a definite agreement. The company asked that the negotiations might be carried out speedily, as it intended, if no agreement were arrived at, to apply for a prov. order to introduce a system of petrol tramcars over the whole of the present route. The T.C. decided to submit its proposals in writing.

Stoke-on-Trent.—In the face of strong opposition, the Federated Council last week passed a resolution to extend the lease of the tramways to the Potteries Electric Traction Co.

York. — TRAMWAY EXTENSIONS SANCTIONED. — The application of the T.C. for powers to extend the tramway system has been granted by the Light Railway Commissioners.

TELEGRAPH and TELEPHONE NOTES.

British Automatic Telephones.—The automatic telephone exchange recently opened by the Indian Government at Simla is reported to have proved immediately successful, and the question of adopting the system at other Indian stations is under consideration. The apparatus was made and erected by the Automatic Telephone Manufacturing Co., Ltd., within 10 months of receiving the order. The company has also installed an automatic exchange at Cordoba for the United River Plate Telephone Co., Ltd., and is now erecting a similar one at Rosario. Each exchange has an ultimate capacity of 10,000 lines; the Cordoba Exchange is at present fitted for 2,000, and that at Rosario for 5,000 lines. At the annual general meeting of the River Plate Co., the chairman said that the service at Cordoba was giving general satisfaction.

Germany.—The *Times* states that a working arrangement has been concluded between the two rival German wireless telegraph companies—the Telefunkengesellschaft, of which Count Arco is the head, and the Hochfrequenzmaschinengesellschaft, which uses the Goldschmidt machines. The extent of the agreement is uncertain, but it is stated that the two companies will share stations—the latter company's station at Neustadt, in Hanover, and the former company's American station at Tuckerton, for communication between America and Germany.

Guernsey.—The statement of accounts of the Guernsey States Telephone Department for the year 1913 shows a total income of £7,139, and expenditure, including interest and sinking fund, £6,375, leaving a net profit of £764, an increase of £156 on the previous year. The loan account stands at £32,000, of which £2,882 has been paid off; the reserve fund for depreciation amounted to £15,542, and the reserve fund for contingencies to £4,223. The total outlay on construction was £45,283, of which £13,283 was paid out of the reserve funds. The number of subscribers' lines was 1,725, an increase of 72; the mileage of metallic circuit wire was 1,446 overhead and 824 underground. The total number of messages during the year was 1,366,433.

International Congress.—At the Congress of Telegraph and Telephone Engineers, which is to be held at Berne on September 1st, the following subjects will be submitted for discussion:—Protection of telegraph and telephone lines from the influence of electric tramway and railway currents; telephoning to great distances through underground and submarine cables; introduction of mechanical working of telephones—its advantage from the standpoints of working and economy, and to what extent its introduction is desirable; comparison of automatic telephony as regards erection and working costs and erection of local stations, with introduction of reduced tariffs, and the study of the best working system for large networks.

Japan.—The expenditure for the extension of the Japanese telephone service during the coming fiscal year is estimated at £300,000, the same as that of last year; the number of telephones to be newly installed will be about 12,000.

Oceania.—Owing to the favourable position of the French Colonies in Oceania on the new shipping routes opened by the Panama Canal, it has been decided to establish a coaling station at Papeete (Tahiti). The future importance of this port demands sufficient facilities for telegraphic communication, and, the nearest cable being 2,125 miles away, wireless telegraphy is to be employed. At present France alone, among the Powers having interests in the Pacific, is inadequately connected with her possessions there. With a view to remedying this state of affairs, large stations are to be erected at Noumea and Papeete. The necessary powers were obtained from the Chamber of Deputies on April 3rd last, credit for £75,500 being voted to the Colonial Minister, and the Colonies agreeing to contribute a total of £20,000 towards the cost of the scheme. It is estimated that the cost of maintaining 8 or 10 hours' service per diem will average about £6,000 per station per annum. The two new stations in conjunction with the French submarine cable from Australia to New Caledonia will connect French possessions in Oceania with sources of coal and other supplies in Australia, and the powerful radio-station now under construction at Saigon will be able to communicate (at least during favourable night hours) with New Caledonia, distant 4,700 miles oversea. The Saigon station will be completed in the spring of 1915, and will be one of the most powerful stations in the world. A 425-H.P. generating set will supply a musical transmission set with current of 1,000 cycles frequency. The aerial will be carried by eight 410-ft. masts, and its length will exceed 2,630 ft.—*La Lumière Electrique.*

Pacific Cable.—The Pacific Cable Board has introduced, as from yesterday, a week-end cable service between Canada and Australasia, the charges being $3 for 20 words and 15 cents for each additional word.

Sweden.—A proposal is to be brought before the Swedish Parliament to contribute 900,000 kronen towards the cost of construction of a direct telephone communication between Sweden and Germany.

Trunk Telephone Service.—The Postmaster-General states that from June 1st the reduced charges at present made for abortive trunk calls will be abolished, and that a system of following up trunk calls, which have failed at the first attempt, will be introduced, without extra charge.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia. — SYDNEY. — July 20th. Box compound, meters, maximum-demand indicators, arc lamp carbons, and straight-stem insulators, for the Council. Specifications for each section 10s. 6d., from City Electrical Engineer, Town Hall.

July 8th. N.S.W. Railways and Tramways Department. One battery booster set to Specification No. 453. Specification (2s. 6d.) from the Electrical Engineer's Office, 61, Hunter Street, Sydney.

MELBOURNE.—June 3rd. Sixty tubular steel tramway poles, and concentric lead-covered cable. City Council. See "Official Notices" May 22nd.

HOBART.—July 20th. Telegraph and telephone material, for Postmaster-General. See "Official Notices" May 22nd.

PERTH.—July 22nd. Telegraph and telephone material, for Postmaster-General. See "Official Notices" May 22nd.

July 1st. 360 accumulators, Tudor type, for Postmaster-General. See "Official Notices" May 22nd.

August 5th. Copper wire and binders, for Postmaster-General. See "Official Notices" May 22nd.

August 12th. Cable, lead-covered and various, for Postmaster-General. See "Official Notices" to-day.

Belgium.—June 2nd. The municipal authorities of Rocour (Province of Liége) are inviting tenders for the concession for the supply of electrical energy for public and private lighting and power purposes in the town.

Brighton.—June 9th. Corporation. 20,000 to 24,000 tons of single washed nuts for the electricity department. Forms of tender from Mr. H. Talbot, Town Clerk.

Canada. — May 30th. Saskatoon City Council.—Two 750-H.P. water-tube boilers, two chain-grate stokers, two sets economisers, and two sets superheaters. Specifications from Mr. E. Hanson, City Electrical Engineer.—*Canadian Engineer.*

Cleckheaton.—June 10th. 3,000 tons of slack coal for the Electricity Department. Mr. J. H. Linfield, Clerk to U.D.C., Town Hall.

Darlington.—June 4th. Corporation. One water-tube boiler and one cooling tower, for the Electricity Department. Borough Electrical Engineer, Electricity Works, Haughton Road.

Dartford.—June 15th. U.D.C. One 500-KW. high-pressure steam turbine, generator, condenser, &c. See "Official Notices" May 22nd.

In our "Official Notices" last week the advertisement of the Dartford Urban District Council, inviting tenders for plant for the electricity works, was inadvertently headed "Urban District Council of *Deptford.*" We regret the mistake.

Dover.—June 2nd. Coal for the T.C. Mr. R. E. Knocker, Town Clerk, 69, Castle Street.

Dundee.—Corporation Electricity Department. Tenders for the execution of steel work for the erection of sub-station in Bellfield district. Mr. H. Richardson, General Manager and Engineer.

France.—Paris.—Machine tools for the State Railways electric material repair-shops at Garenne. Particulars, 72, Rue de Rome, Paris.

June 3rd. Supply of bronze and copper wire, in 33 lots, to Ministry of Posts and Telegraphs. Particulars, 103, Rue Grenelle, Paris.

Brest.—Tenders are required (1) for the construction of an ironwork building at the naval dockyard at Brest; (2) for the equipment of the same, including six 5-ton electric cranes, two 30-ton travelling bridges, a lift, and sundry accessory lifting appliances. Intending tenderers must apply at once for the bases of competition and leave to compete, to M. le Directeur des Constructions Navales, at Brest.

Glasgow.—June 4th. Corporation. 145,000 tons of coal (singles and pearls) for the Electricity Department. Specification from Mr. W. W. Lackie, Engineer, 75 Waterloo Street.

Grays.—June 15th. U.D.C. 12 months' supply of Griff or Babbington hard steam coal for the Grays Thurrock U.D.C. Forms of tender from the Electrical Engineer.

Great Torrington.—Firms willing to undertake installation and working of the electric lighting should communicate with Mr. G. M. Doe, Solicitor, Great Torrington. See "Official Notices" to-day.

Harrogate.—June 22nd. Corporation. Economiser, 288 pipes, for Electricity Department. See "Official Notices" to-day.

Hornsey.—June 3rd. B.C. Twelve months' supply of coal for the Electricity Department. Forms of tender from the Town Clerk's Office, 99, Southwood Lane, Highgate, N.

H.M. Office of Works.—June 2nd. Three years' supply of lift ropes. See "Official Notices" May 22nd.

Keighley.—June 11th. Small slack (about 6,000 tons) for the Electricity Department. Mr. H. Webber, Borough Electrical Engineer and Tramways Manager, Power Station, Coney Lane.

Leeds.—June 29th. Corporation. Air-cooled transformers. See "Official Notices" May 22nd.

Liverpool.—June 2nd. Electrical fittings and stores for 12 months, for the directors of the Liverpool Overhead Railway. Forms of tender from the Manager, 31, James Street.

London.—L.C.C.—June 4th. Installation. 760 wiring points, 900 lights; telephones, call and fire bells; at Furzedown Training College and Hostels, Tooting, S.W. See "Official Notices" May 15th.

Tenders are to be invited by the Highways Committee for the supply of rotary converters, static transformers, and an overhead crane required in connection with the re-arrangement of tramways sub-stations and sub-station plant, and also for the supply of certain plant, tools, and equipment for the Cressy Road, Hampstead, and the Camberwell car-shed extensions.

June 23rd. 50, 100 or 150 complete trailer-cars and equipment of 200 existing electric motor-cars with couplers and traction gear for drawing trailer cars. See "Official Notices" to-day.

Battersea.—June 24th. B.C. Coal telpherage plant. See "Official Notices" to-day.

Metropolitan Police.—June 3rd. Three years' supply and maintenance of electrical cell-calls at Police Stations and Courts, for the Receiver, New Scotland Yard. See "Official Notices" May 22nd.

St. Pancras.—June 3rd. B.C. Coal for 12 months for the Electricity Department. Forms of tender from the Electricity Department, 57, Pratt Street, Camden Town, N.W.

Hampstead.—June 11th. B.C. One 1,500-kw. turbo-alternator, barometric jet condenser and pipework, cooling tower and tanks. See "Official Notices" May 22nd.

Stepney.—June 11th. B.C. Three years' supply of meters, demand indicators, time switches and carbons. See "Official Notices" May 22nd.

Loughrea (Co. Galway).—May 30th. Gas engine and suction plant, dynamo and motor booster, storage battery, switchboard, overhead lines and street lamps, for Loughrea Electric Power and Lighting Co. See "Official Notices" May 15th.

Manchester.—June 10th. The Education Committee is inviting tenders for a complete electric lighting installation at Soss Moss Special School. Specifications, &c, £1 1s. (returnable) from the Education Offices, Deansgate.

June 12th. Corporation. Twelve months' supply of washed and dry coal for the Electricity Committee. Forms of tender from Mr. F. E. Hughes, Secretary, Electricity Department, Town Hall.

Morecambe.—June 25th. Corporation. 2,500 tons of coal or slack, for Electric Supply Department. See "Official Notices" to-day.

New Zealand.—Wellington.—July 9th. City Council. Electric chassis for a 2,000-lb. parcels delivery van, and an electric car, for the Electric Tramways Department. Specification may be seen at the Board of Trade Commercial Intelligence Department in London.

July 27th.—New Plymouth B.C. (2) Overhead wiring and permanent way (5 route miles). (3) Sub-station equipment (converting plant, battery, booster, switchboard, &c.). (4) Rolling stock (six complete cars) for electric tramways. Specifications from Mr. F. Black, Consulting Engineer, Wellington, or B. of T. Offices, London. Deposit (2) £4 4s.; (3) £2 2s.; (4) £2 2s.—*N. Z. Shipping and Commerce.*

Auckland.—August 6th. Three 750-kw. d.c. mixed-pressure turbo-generators; one 1,500-kw. three-phase turbo-generator, including auxiliary plant and sub-station equipment. See "Official Notices" May 22nd.

Penrhiwceiber (Glam.).—June 3rd. Twelve months' supply of electrical fittings, stores, &c., for the Penrikyber Navigation Colliery Co., Ltd. Forms of tenders from the Secretary.

Rochdale.—June 3rd. Electric automatic book lift for the Treasurer's Department. Mr. P. W. Hathaway, A.R.I.B.A., Town Hall.

Spain.—June 5th. Tenders are being invited by the municipal authorities of Cabra (Province of Cordoba) for the concession for the electric lighting of the town during a period of four years.

Swindon.—June 3rd. Corporation. Steam coal. See "Official Notices" May 22nd.

Salford.—June 15th. 24 car bodies, also trucks, motors, controllers, &c., for same. General Manager, Corporation Tramways, 32, Blackfriars Street.

Wallasey.—June 6th. Steel framed buildings for the generating station in Dock Road, Poulton. Drawings, &c, £2 2s., obtainable from Mr. J. A. Crowther, Borough Electrical Engineer, Seaview Road.

Warwick.—June 1st. B.C. Manholes, chambers, sedimentation and storm-water tanks, and other works. See "Official Notices" May 15th.

June 1st. B.C. Electric motors, centrifugal pumps, switchgear, automatic control apparatus, pipes, valves, &c. See "Official Notices" May 22nd.

CLOSED.

Australia.—P.M.G.'s Department:—

Victoria.—90,000 pattern "A" insulators, £2,250.—Warburton, Franki (Melbourne), Ltd.

Queensland.—500 C. B. table pattern telephones, £737: 100 ditto, £390: 700 ditto, wall pattern, £1330.—J. Paton & Co.

N.S.W. Railways and Tramways Department.—Eight d.c. motors to specification 445.—Standard Waygood Hercules, Ltd.—*Tenders.*

Barnes.—The U.D.C. has decided during the year to order 100 meters from the Electrical Apparatus Co., Ltd.

Barrow.—The T.C. has placed an order for a feed pump with the Pulsometer Co, the price, exclusive of erection and connections, being £88; and one for a transformer, £109, with Messrs. Ferranti. Arrangements have been made with the B.I. and Helsby Cables, Ltd., for the purchase of 6 tons of copper, at £66 10s. per ton, to be made into cable as and when required.

Belgium.—Eleven firms—two French, one Italian, five German and three Belgian—last week submitted tenders to the Belgian Post and Telegraph authorities, in Brussels, for the supply of 195 tons of copper wire. La Compagnie Française des Métaux, of Paris, submitted the lowest tender for 100 tons, while the lowest offer for the other 95 tons came from the Westfalische Kupfer und Messingwerke Gesellschaft, of Ludenscheid, Westphalia.

La Société Electricité de l'Est de la Belgique, of Verviers, has secured the concession for the electric lighting of the little town of Thimister (Province of Liége).

Buckhurst Hill.—The U.D.C. has accepted the tender of Messrs. Stuart & Moore, Ltd., of Ealing, W., for the installation of electric call-bells for the fire brigade, at £88 11s., with £8 a year for maintenance.

Burton-on-Trent.—The T.C. has accepted the tender of Messrs. Manlove, Alliott & Co, Ltd., for extensions to the refuse destructor plant, at £1,765.

Colwyn Bay.—Messrs. Chamberlain & Hookham, Ltd., have received the contract for meters.

Falkirk.—The T.C. has accepted the following tenders for annual stores:—

Heavy cables.—Callender's Cable Co.
Small cables.—W. Geipel & Co.
Polyphase meters.—The Electrical Co.
Single-phase meters.—Bat Meter Co.
D.C. meters.—Chamberlain & Hookham and Reason Manufacturing Co.
House service fittings.—Henley & Co.
Transformers.—Ferranti, Ltd.
Metal-filament lamps.—Millar & Stewart.

Glasgow.—The Tramways Committee (Works and Stores) recommends the acceptance of the following tenders:—

Clevis bolts.—J. Hally Craig.
Rubber-insulated cable.—W. T. Henley's Telegraph Works Co., Ltd.
Three-core lead-covered cable; single core lead-covered cable.—J. Hally Craig.
Double-lead sheathed telephone and test cables; E.H.T. rubber-insulated cables.—B.I. and Helsby Cables, Ltd.
Rails and fishplates for Govan depôt.—Barrow Hæmatite Steel Co., Ltd.

The offer of Messrs. Johnston Park & Co. (£125) to rewire the electric light installation at the sewage disposal departments, works and stables, at Haghill, has been accepted.

Edinburgh.—The Corporation has placed the contract for continuous-current meters (Bastian patents) with the Electrical Co., Ltd.

Ilford.—The District Council proposes to enter into a fresh contract with the New System Private Telephone Co., Ltd., in respect of the whole installation of 22 instruments for a period of eight years.

London.—L.C.C. The Education Committee recommends that the chairman, vice-chairman, and deputy-chairman of the Council, and the chairman and vice-chairman of the Education Committee and of the Buildings Sub-Committee of the Education Committee be each authorised during the Whitsuntide recess to open the tenders received for the installation of electric light at Furzedown Training College and Hostels, Wandsworth, and to accept the lowest satisfactory tender.

The Highways Committee reports the receipt of the following tenders for the supply of wood-working machinery and equipment required for the third section of the central car repair depôt.

W. B. Haigh, Gruban & Co., Ltd.		£1,372
" " "	(alternative)	1,385
Buck & Hickman, Ltd.	(not to specification)	1,486
" " "	(alternative)	1,541
J. Pickles & Son	"	1,531
T. Robinson & Son, Ltd; Wadkin & Co.; A. Ransome & Co., Ltd.	(incomplete tenders)	

The Committee recommends the acceptance of the tender of Messrs. W. B. Haigh, Gruban & Co., Ltd., for £1,372 (including a provision of £30 for pulleys and £25 for extra works if required).

The Committee has accepted the tender of Messrs. Newton Bros., for the reconstruction of two 50-KW. motor-generators.

The Committee recommends that none of the tenders received for the supply of polyphase electricity meters be accepted. Only two tenders were received, and the prices were much in excess of the estimate.

The Committee also recommends that a pneumatic hoist, portable compressed-air cleaning apparatus, two magnetic-brake testing instruments, and one insulation-resistance testing instrument be obtained from Messrs. S. H. Heywood & Co., the Globe Pneumatic Engineering Co., Messrs. Elliott Bros., and Messrs. Evershed and Vignoles, Ltd., at the estimated costs of £180, £150, £30, and £14 respectively.

The Committee reports the acceptance of the tender of the B.I. and Helsby Cables, Ltd., for the supply of copper bonds for 12 months—Class T, 8 items, 1 (A) and 1 (B); and also the acceptance of the undermentioned tenders for the supply of materials in connection with the equipment of the boiler-house workshop at the Greenwich generating station:—

High-speed shaping machine, emery grinder and universal disk grinder.—Selson Engineering Co., Ltd., £104 10s., £29 10s., and £55 10s. respectively.
High-speed sensitive drill, and grindstone and trough.—Buck & Hickman, Ltd., £12 16s. 6d. and £8 respectively.
Portable air-compressor and tools.—Alley & MacLellan, Ltd., £233 10s.
Rope-testing gear.—W. and T. Avery, Ltd., £21 5s.

HAMMERSMITH.—The B.C. Electricity Committee reports the receipt of the undermentioned tenders for switch fuses and apparatus for sub-stations:—

Universal Electric Manufacturing Co., Ltd.	(recommended)	£ 6
Seage & Co.		41
Spagnoletti, Ltd.		41
" " (alternative)		40
British Calibrated Fuse Co.		65
G.E. Co.		70
Turners & Manville		67

For relagging the boilers and sundry steam pipes at the generating station, the tender of Messrs. Matthew Keenan & Co., Ltd., at 10½d. per ft. super., is recommended.

The following tenders for insulated wires for the year ending March, 1915, have been received:—

Armorduct Manufacturing Co., Ltd. (Foreign)	(recommended)	£98
Ward & Goldstone, Ltd.		108
Pirelli, Ltd. (Foreign)		109
Drake & Gorham, Ltd. (Foreign)		111
Electrical Co., Ltd.		123
Liverpool Electric Cable Co.		127
G.E. Co., Ltd.*		129
C. Mackintosh & Co., Ltd.*		141
Gillespie & Beales		146
Geipel & Co.*		155
Electrical Trades Supply, Ltd.		165
Callenders, Ltd.		169
Johnson & Phillips, Ltd.		169
London Electric Wire Co.		169
W. T. Henley's Telegraph Co.		169
British Insulated and Helsby Cables		170
Siemens Bros., Ltd.		171
India-Rubber and Gutta-Percha Co.		172
Western Electric Co., Ltd.		172
W. T. Glover & Co., Ltd.		173
Edison and Swan U.E.L. Co., Ltd.*		170

* Net. All the other tenders are subject to a 2½ per cent. discount.

MARYLEBONE.—The Guardians have accepted the tender of Messrs. Lund Bros. & Co., at £1,783, for installing electric light at the North Kensington Infirmary. In all, 14 tenders were received, the prices ranging from that accepted to £3,075.

Huddersfield.—The Corporation Electricity Committee has accepted the following tenders:—

Switchboard for tramway supply.—Ferguson, Pailin & Co.
Steam pipes.—John Spencer, Ltd.
Cable.—Geipel & Co., and B.I. and Helsby Cables, Ltd.
Switchgear for controlling the motor-converters at the tramway power station.—Bruce Peebles & Co., Ltd.

Llanfair Caereinion.—Mr. R. Edwards, of Llannwchllyn, has received the contract for the electric lighting scheme. The work is to be completed by October 1st.

New Zealand.—DUNEDIN.—The Electric Power and Lighting Committee has accepted none of the tenders received for constant-current transformers and street-lighting material, but has recommended that tenders for these supplies be obtained as required.—*N.Z. Shipping and Commerce.*

Rochdale,—For the Corporation electricity station there has been placed with Messrs. E. Bennis & Co., Ltd., through Messrs. Clarke, Chapman & Co., Ltd., a contract for eight chain grate stokers, each 11 ft. 5 in. long × 5 ft. 4¾ in. wide, for Woodeson water-tube boilers.

South Africa.—HEIDELBERG, TRANSVAAL.—The Council has placed the order for the erection of a complete power station with the A.E.G. Electrical Co., of South Africa, Ltd., Johannesburg.

The Public Works Department of the Union of South Africa has placed an order with the same company for its total requirements throughout the Union of drawn-wire lamps during the next 12 months.

Southend-on-Sea.—The T.C. has accepted the tender of Messrs. Grenshaw & Peers, of Bolton, for three electrically-driven coal wagons for the electricity works, at £303.

Stirling.—The T.C. has accepted the tender of Messrs. Callender's Cable and Construction Co., Ltd., for a feeder cable, at £816.

Walthamstow.—The U.D.C. is recommended to accept the tenders of Messrs. Babcock & Wilcox, at £2,585, for the supply of an additional boiler, overhead bunkers and conveying plant at the electricity works, and at £385 for the supply and fixing of pipe work; and that of the New Conveyor Co., Ltd., at £3,825, for installing conveyors and ash bunkers.

West Ham.—The tender of Messrs. John Baker & Co. (Rotherham), Ltd., is recommended to the T.C. for acceptance for a supply of 32-in. and 22-in. tramway tires, at £1 6s. 8d. and 19s. 3d. each respectively.

Weymouth.—The T.C. has accepted the tender of Mr. G. Bryer Ash for a year's supply of Newbury best steam coal for the electricity works, at 13s. per ton delivered at the works.

FORTHCOMING EVENTS.

Liverpool and District Electrical Masters' Association.—Friday, May 29th. At 7.45 p.m. At St George's Restaurant, Redcross Street, Liverpool. First smoking concert.

Institution of Mining Engineers.—Thursday, June 4th. At 11 a.m. At Burlington House, Piccadilly, W. General meeting. At 7 p.m., at Hotel Cecil, anniversary dinner.
Friday, June 5th. River trip.

Salford Technical and Engineering Association.—Thursday, June 4th. Whit week tour: Scarborough and district.

Royal Institution of Great Britain.—Thursday, June 4th. At 3 p.m. At Albemarle Street, W. Lecture on "Faraday and the Foundation of Electrical Engineering," by Prof. Silvanus P. Thompson, F.R.S.
Friday, June 5th. At 9 p.m. Paper on "X-rays and Crystalline Structure," by Prof. W. H. Bragg, F.R.S.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—LIEUT.-COL. H. M. LEAF.

The following orders have been issued:—

Friday, May 29th.—"D" Company. Infantry drill, 7 to 9 p.m. Technical instruction, 9 to 10 p.m. Miniature range instruction, 7 to 9 p.m.
Saturday, May 30th.—Headquarters will be opened from 10 a.m. till 12 noon for regimental business only.
Monday, June 1st. / Tuesday, June 2nd. } Headquarters will be closed for the Whitsun holidays.
Wednesday, June 3rd.—All Companies. Rating examination will be held from 7 to 10 p.m.
Thursday, June 4th.—"C" Company. Infantry drill, 7 to 9 p.m. Technical instruction, 9 to 10 p.m. Miniature range instruction, 9 to 10 p.m.
Friday, June 5th.—"D" Company. Infantry drill, 7 to 8.30 p.m. Technical instruction, 8.45 to 10 p.m. Miniature range instruction, 8.45 to 10 p.m.
Saturday, June 6th.—Headquarters will be opened for regimental business from 10 a.m. till 12 noon.

(Signed) F. R. HOLT-WHITE, Capt. R.E., Adjutant,
For Officer commanding L.E.E.

NOTES.

Electric Lamps for Miners.—Mr. McKenna stated in the House of Commons last week that researches made in recent years appeared to point strongly to the conclusion that working in insufficient light was the main cause of miners' nystagmus, and this point was kept in view when it was decided to impose photometric tests for all types of safety lamps approved under the Coal Mines Act, 1911. He was advised that as a result of these tests, and of the increasing use of electric lamps, the illumination below ground was improving, and he trusted that as this improvement continued it would have a substantial effect in reducing the number of cases of nystagmus.

"Laugh, and the World Laughs with You."—A Scottish correspondent writes:—"There was a bit of a shindy at a meeting of the Falkirk Town Council over a proposal to send delegates to the Incorporated Municipal Electrical Association's Congress. A section of the Council objected on the ground of expense, and, turning to them, Bailie Dillon remarked:—'Try economies and you are nowhere. It is the old saying brought back—Snore, and you sleep alone. Economise, and you fight alone.' Lively talk followed, but in the end it was agreed that representatives be sent."

Notes from Canada.—Our Canadian correspondent writes:—Part of a resolution recently passed by the Ontario Parliament reads as follows:—

"In the opinion of this House, cheap and convenient electric railway transportation facilities are one of the most urgent needs in many rural sections and towns of the Province, and this House would respectfully urge upon the Dominion Government the importance of the question and the wisdom of encouraging the construction of municipal hydro-electric radial railways, and that this House further respectfully urge upon the Dominion Government the great importance of co-operating with the Province in the development of the water powers created by existing and projected canals now under construction, and capable of development by the utilisation of the water powers necessarily supplied thereto, and not required for navigation purposes."

The Canadian Pacific Railway is considering the question of the electrification of its terminals at Montreal, and it is also reported that at Roger's Pass Tunnel in the Selkirk Mountains, B.C., a length of 20 miles will be operated electrically, instead of only 5 miles as previously intended.

It has been announced officially in Vancouver, B.C., that the Public Service Corporation may shortly construct a plant in which the waste material from sawmills will be used for generating heat and light for general distribution in the business parts of the city.

A municipal electric store in Saskatoon, Saskatchewan, is declared to be a failure, and a private company has offered to take it over.

In the Ontario Legislature, after considerable discussion on the subject of public ownership of telephones, it was decided that the proposal was not feasible at present.

Extensions to the tramway system in Edmonton, Alberta, to cost about £33,600, are to be undertaken, and the ratepayers have just voted approval of a by-law for that amount.

Owen Sound, on the shores of Georgian Bay, is considering the question of having a tramway system; a private company is asking for a 25 years' franchise.

From Richelieu to Sherbrooke (a distance of about 70 miles as the crow flies) in Quebec, a 50,000-volt transmission line is to be built, although a portion only of the line will be constructed at present.

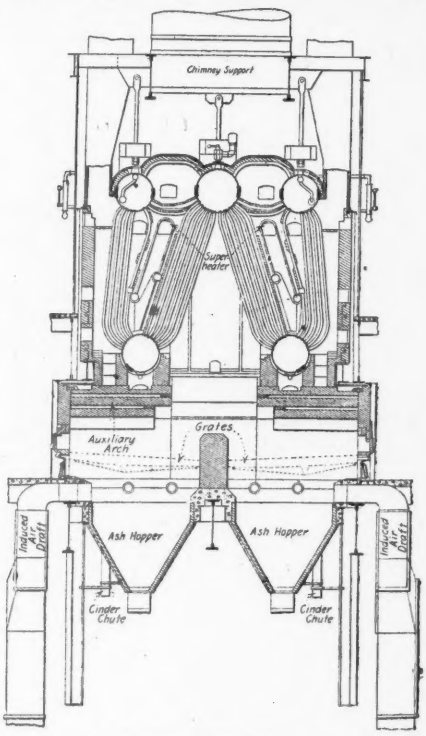
For extensions to the Ontario Hydro-Electric Power Commission's system about £1,000,000 has been provided in the Provincial estimates for this year. The money is divided up somewhat as follows:—

Niagara system extensions	£680,436
Severn system	110,000
Wasdell's Falls development	38,350
St. Lawrence system	4,536
Port Arthur system	4,102
Eugenia Falls system	50,000
Office building	30,000
Provincial work	33,000

Electric Lighting in Tokio.—The last Japanese mail brings the news that the problem of the unification of the electric lighting interests in Tokio by the amalgamation of the three existing concerns is expected to be the next topic to engross public attention after the election of members of the Tokio municipal council, which is to take place next month. The three concerns, which have been in keen competition, are stated to have at last become impressed with the risks attending the continuance of the competition. It is reported that the Municipal Electric Bureau is actually suffering loss, and that it is only by the profits realised from the tramways that the deficit on the electric lighting undertaking is being covered. The greatest difficulty to be surmounted in bringing about the amalgamation of the three concerns is the conflict of interests between the Tokio Electric Light Co. and the Kinugawa Hydro-Electric Co. with respect to the supply of power, this having become a cause of competition between the two concerns since the Tokio Co. purchased the interests of the Katsuragawa Hydro-Electric Co. However, the conflict of their interests is not apprehended to be entirely beyond a compromise.

Unsaleable Fuel for Generating Electricity.—The *Electrical World* of May 9th and 16th gives a full description of a power station which has been built by the Lehigh Coal and Navigation Co. to utilise refuse coal for which there is no market. The company turns out annually enough anthracite coal refuse to maintain in continuous operation generating plant of 100,000 KW.; the present installation is of 30,000 KW., but ultimately it will be extended to the former figure. Philadelphia and New York are distant only 73 and 98 miles respectively; the working pressure is 110,000 volts, except for local consumers.

The boilers are arranged in a single row beneath the railway track, on which 50-ton standard-gauge cars run, dumping their contents into bunkers holding two days' supply of coal. Ashes are removed by running railway trucks into the basement under the ash hoppers. The low grade of fuel employed necessitated the use of special grates and combustion chambers. Eight double-



SECTION OF BOILER.

ended Babcock & Wilcox boilers are installed, each having four grates; the boilers are of the five-drum bent-tube type, with superheaters, as shown in the accompanying figure. Six of the boilers are fitted with hand-fired grates, 12 ft. × 8 ft., making a total grate area of 384 sq. ft. each boiler. The other boilers have mechanical stokers. Details of the grates are given in the article, as well as other novel features, such as sliding furnace doors, double fire arches with air spaces between, &c. Steel smoke-stacks are used, and to economise in building construction the flues are connected with them *above* the roof of the boiler-house, where economisers can be installed later if desired. Forced draught is provided (not induced draught, as indicated in the figure) by electrically-driven Sirocco blowers.

There are three 12,500-KW. 11,000-volt 25-cycle turbo-generators, the turbines being bladed on the A.E.G.-Rateau system, while the rest of the design is of Curtis type; the steam consumption is 12·3 lb. per KW.-hour at full load, with a vacuum of 28 in. Cooling water for the Leblanc jet condensers is obtained from an artificial pond of 269 acres, which serves as a cooling pond, the intake and discharge pipes being about 4,000 ft. apart.

Copper.—The mid-monthly figures for supplies, as tabulated by Messrs. H. R. Merton & Co., show that the reserve is maintained, in spite of the large consumption of last month. English supplies have increased 355 tons, French 1,281, and European 906 tons, as compared with the end of May, 1914. Arrivals from North America for the fortnight are on the low side, Spain and Portugal send the average amount to this country; Chile shipments are just on the average, and Australian a little above. Total deliveries for the fortnight are lower at 22,175 tons, but this may, of course, be altered so far as the monthly output is concerned. The stocks in American producers' hands, according to the American Producers' Association's figures, were, at the end of April, 31,401 tons. At the same date the world's visible supplies were 60,679 tons, a considerable increase over the total at the end of March.

A Manchester Committee.—When the resolution mentioned in our last issue concerning a councillor having exercised influence over Corporation officials in the letting of contracts, came before the City Council on May 20th there was no seconder.

(*Continued on page* 915.)

The Semi-Automatic Telephone Exchange of the City of Dresden.

[BY OUR BERLIN CORRESPONDENT.]

THE equipment of the Telephone Exchange of the city of Dresden has, during the last two years, undergone a complete transformation, hand operation being replaced by a semi-automatic service. The last subscriber connected to the hand-operated Exchange was, on January 29th last, switched over to the new Exchange, thus completing a conversion which, on account of adverse local conditions, had to contend with enormous difficulties.

Though the installation of the new Exchange was commenced a short time after the inauguration of the Posen semi-automatic Exchange (in July, 1912), the first subscribers could not be connected up to the new apparatus before the month of April of the following year, and another nine months of strenuous work was required to bring the work to a successful conclusion. In fact, local conditions entailed a gradual conversion from the old to the new mode of operation, which, in its turn, required the installation of a special intercommunication service between the old and new Exchanges. The difficulties thus occasioned were intensified by a temporary rather troublesome lack of space, so that the equipment of the operators' positions could not be installed before providing for space by the conversion of some of the subscribers' circuits.

FIG. 1.—INQUIRY STATION AND ADDITIONAL SWITCHBOARDS.

The new semi-automatic telephone exchange is housed in a building owned by the Imperial Post Office, on Post Square, the selectors being installed on the third and fourth floors, in four halls. Hall 1 (figs. 2 and 3), situated on the fourth floor, on Marienstrasse, comprises all the selectors for the first 10,000 subscribers' circuits, with the exception of the second group selectors, installed in Hall 2, on the third floor (fig. 4, p. 912). The selectors for the subscribers' circuits

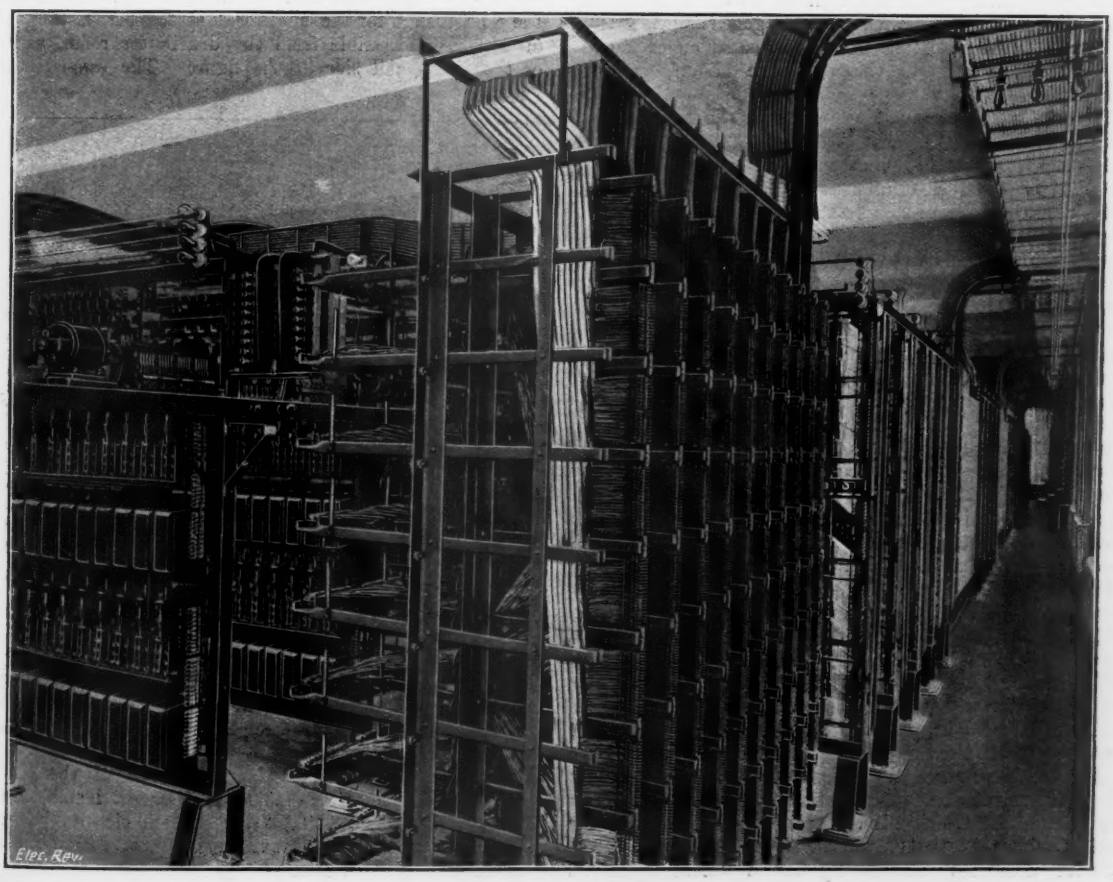


FIG. 2.—PRE-SELECTORS, GROUP AND CIRCUIT SELECTORS FOR SUBSCRIBERS 1—10,000 (HALL 1).

10,000-20,000 are installed in Hall 3, on the fourth floor —on Wallstrasse—and the corresponding second group selectors and special selectors for subscribers having several circuits in Hall 4 (fig. 5, p. 913), situated below the former. In Hall 2 there are installed, in addition to the second selectors for the first 10,000 subscribers' circuits, the motor-driven number transmitters for the operators' keyboards, as well as the calling current and buzzer machines.

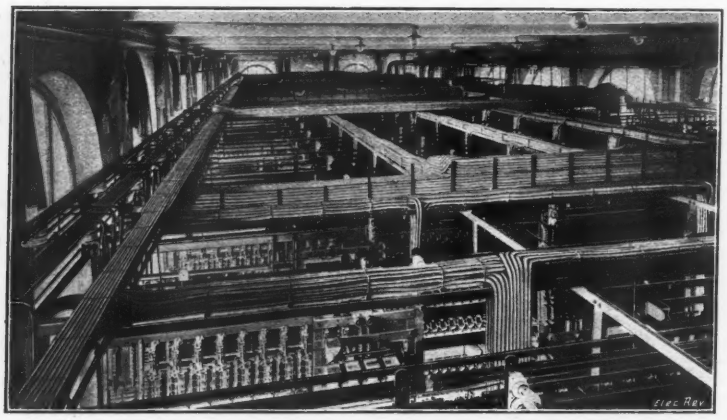


Fig. 3.—Selector Frames, seen from above (Hall 1).

In one of the halls on the third floor there is installed what is called the Inquiry Station, which comprises the whole of the hand-operated switchgear (fig. 1, p. 911), viz., 30 tables each with two operators' positions opposite one another, two additional switchboards with a total of six operators' positions, for the trunk service, and three additional switchboards, with a total of nine positions, for the incoming and outgoing suburban service. The 60 inquiry positions have each been equipped with two sets of keys for effecting any connection desired by subscribers. The mode of operation may be briefly described as follows: —

As the subscriber, in the usual manner, calls up the exchange by taking his receiver off the hook, he is, by his pre-selector, connected with a disengaged first group selector. At the same time there is actuated an exchange selector, which connects the telephone of an operator who happens to be disengaged to the calling subscriber's circuit. The operator hears the call with her head telephone without performing any manipulation for this purpose. She inquires, and while repeating the number stated by the subscriber, presses down in succession the keys corresponding to the figures named, thus actuating the number transmitters, and by means of these the selectors. As soon as the operator has pressed down the last key (units), she is switched off automatically, and thus becomes available for another call, to be dealt with by means of the second key-board, while the selectors are still busy with the former connection. The whole of the work of these operators is thus limited to inquiring the number desired and adjusting for it on the key-board, all the rest being done by the selectors.

Whenever the subscriber desires a connection with a suburban circuit, the operator switches his circuit up to the additional switchboard, by pressing down key 6 of the ten-thousand row. Connections with the trunk-line record table are effected in a similar manner, by pressing down key 0.

Between the operators' positions of the two front tables of the inquiry station, a considerable number of call lamps are seen in the table centre, one lamp being provided for each Exchange selector, which is lighted in case the selector does not immediately find a vacant operator's post, when a call is received. The calling circuit is then switched on to a waiting contact and assigned automatically to the next working position that becomes vacant.

In front of these operators' positions there is placed transversely to the row of tables a superintendents' table, which, apart from some further checking devices, is fitted with a signal lamp and jack for each operator's position. Each time a call arrives at the Exchange the checking lamp assigned to the busy operator's position is lighted, to be extinguished again as soon as the call has been dealt with. By plugging into the jacks the superintendent, without the operator's knowledge, is able to switch herself on to each operator's position, thus accurately checking the service.

Moreover, there has been provided, for continually superintending the whole of the service, a special working room, where all the signals of the various groups of apparatus are repeated. There are further installed there recording instruments, which automatically record the current consumption, as well as instruments allowing the number of connections effected and simultaneously existing in the various groups to be gauged, so that the load on the exchange may be checked at any time. Any trouble is signalled and recorded automatically at this central post, while checking apparatus enable the whole of the *personnel* to be permanently supervised.

Two accumulator batteries, charged from the Post Office power house, are provided for supplying current to the selectors, and for the central feeding of the exchange and subscribers' microphones. The single-phase current required for calling subscribers is supplied by four converters connected up to the lighting mains, the buzzer currents for the "no-reply" and "busy" signals being generated by four collector buzzers (fig. 6, p. 914).

In fig. 7 (p. 914) is illustrated the main distributor installed in a special room, by which the external circuits are connected up to the exchange circuits. In the centre there are installed the relay frames for the additional switchboards, the back of which is accessible from the distributor room, as seen on the right-hand side of the figure. The same picture,

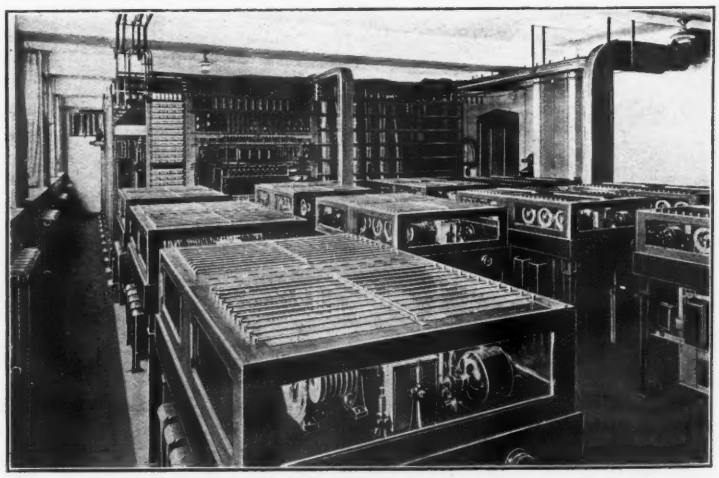


Fig. 4.—Second Group Selectors for Subscribers 1—10,000, and Figure Transmitters (Hall 2).

like fig. 3, illustrates in a striking manner what an enormous number of cables and individual conductors have to be dealt with and arranged in a straightforward way in erecting a large telephone exchange.

The semi-automatic telephone exchange of the city of Dresden is at the present moment the largest installation of this kind in existence, 16,000 subscribers' circuits being so far in operation. Another exchange is shortly to be installed in the suburb of Striesen.

Messrs. Siemens & Halske, to whose courtesy we are indebted for the particulars embodied in this article, have installed not only the Dresden exchange, but also a number of other exchanges of a similar kind, among which those of Posen and Amsterdam are the most important. Semi-automatic exchanges are being installed also at Liegnitz and Leipzig.

ELECTRICITY FROM PEAT.

By GEORGE CLIFTON.

The possibilities of producing electrical energy from peat through the medium of a producer plant are rapidly becoming recognised by engineers on the Continent, although for some reason the idea has not met with so much favour in this country. In Ireland and parts of England and Scotland there are tens of thousands of acres of peat bog of which no use is made.

Various projects have been mooted from time to time, but little has actually been done in this country in connection with the utilisation of peat.

In Sweden, on the other hand, a large number of peat-fuel plants are in successful operation. The power is obtained by driving generators with gas engines fed from suction producer plants.

Practically all the peat fuel obtained at present is air-dried, as this process, in spite of the element of uncertainty, appears to be the cheapest and most practical. It has been said that when peat is properly treated, the removal of the water is a very easy matter, and the more water there is in the peat the easier it is to deal with the substance, and to produce a hard and dense fuel which, when dried, will not contain more than 15 per cent. of moisture. This moisture, moreover, is in a state of combination with the peat, and is given off, during the manufacture of charcoal, in the form of mixed gases in which hydrogen largely predominates. The process mentioned consists of desiccating or pulping the peat in order that all the fibres may be thoroughly crushed and broken. It is evident that otherwise these fibres, which are actually tubes, would hold a high percentage of moisture, which would either delay the air-drying process or lead to a false appearance of dryness, which might cause an attempt to be made to convert the peat into fuel prematurely. These fibres, or tubes, if not destroyed, hold the water, which turns to steam in the drying, and causes the blocks of fuel to crack and disintegrate.

Further, unless peat is air-dried—that is to say, if any compressing process is adopted with a view of eliminating the moisture—a number of valuable by-products are also removed. These comprise sulphate of ammonia, methyl alcohol, acetic acid, pyridine and paraffin wax. In addition to these by-products, the peat, when treated in a by-product recovery plant, yields just over one-third of a ton of hard black charcoal per ton treated.

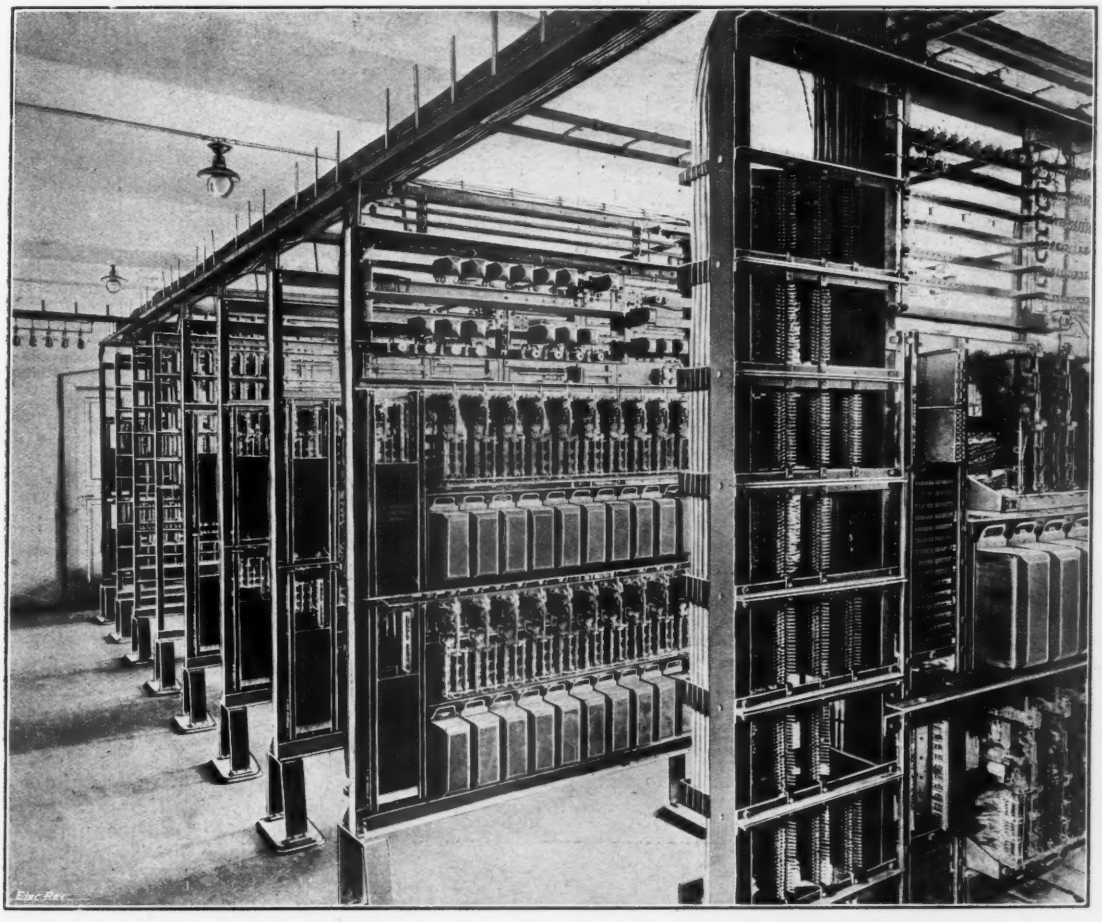


Fig. 5.—Dresden Telephone Exchange: Group Selectors, and Selectors for Subscribers with several Circuits (Hall 4). (See p. 912.)

With producers working with peat one of the principal difficulties lies in getting rid of the tar. Experiments have been tried in the direction of working such producers intermittently, there being periods of blowing during which the fuel in the producer was raised to incandescence, and periods of gas-making during which the tarry by-products were passed through the glowing mass and split up into gas. The resultant combustible mixture has too high a calorific value, some 330 B.TH.U., for use in ordinary gas engines. It would, however, appear evident that the proper course to pursue would be to extract the tar and other by-products from the gas by passing it through suitable scrubbers and cleaning chambers fitted with baffle plates before allowing it to pass to the engine.

Recently a special plant was erected by a leading firm of engineers to work with peat fuel. The results obtained

have been perfectly satisfactory, and during a six hours' test run with a load of 250 B.H.P., the peat consumption per B.H.P.-hour averaged 2·55 lb. It must be noted in this connection that the water content of the peat used was approximately 19 per cent. It was found, however, that the plant worked as well with sodden as with dry peat, the only difference being in the amount of fuel used. Peat was successfully used which had a water content as high as 70 per cent.

Coke scrubbers are not particularly efficient as a means of removing peat tar from the gas. A water spray of ample size is much more reliable, as it acts as a cooler as well as a washing agent. The plant mentioned above required cleaning at first at least once a week. It can now be run for treble that time or longer if necessary, this being due to an increase in the quantity of water used for washing. As some guide to the amount required for the purpose it may be said that the best results are obtained when between 6 and 8 gallons per B.H.P.-hour are used. The tar recovered amounts to 5 per cent. by weight of the peat consumed, and has a certain market value which varies according to its quality and its contents of pyroligneous acid.

With such results as those outlined above, and with the examples of successful working given abroad, it would appear that the manufacture of air-dried peat fuel, to be used for the generation of electrical energy, is a sound business proposition, and one which should commend itself to engineers, especially in view of the necessity for cutting down production costs to the lowest possible point. It is really a matter for wonder that so few English engineers, comparatively speaking, have as yet given any serious attention to the subject.

COMPETITION IN GERMANY.

It is tolerably well known that the largest firms in Germany co-operate with each other occasionally in the case of huge contracts involving an expenditure of, perhaps, hundreds of thousands of pounds, but in contracts of comparatively small amounts they enter into keen competition with one another and also with the firms of lesser importance, which have been given the title of the "special electrical works." A representative of one of the latter has just taken the opportunity of attacking the policy of local authorities, especially the city of Berlin, and the installation contractors, although the latter have hitherto been regarded as being in the same position as the special firms. The special works not unnaturally claim to be efficient in the production of dynamos, motors and apparatus, but it is urged on their behalf that the State authorities and the local authorities scarcely do anything substantial to provide

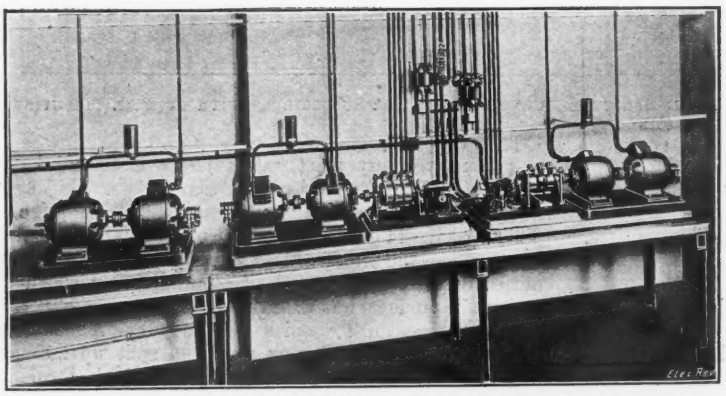


Fig. 6.—Dresden Telephone Exchange: Signalling Machines. (See p. 912.)

work for them. In the case of the city of Berlin, which now owns a few miles of tramways, it is said that special works, the names of which have been on the city's list of contractors for 10 years, have only received orders for a few hundred shillings during that period, although the contracts allocated by the city must have amounted to many millions of shillings, and many firms have not even received an inquiry from the municipal authorities in the

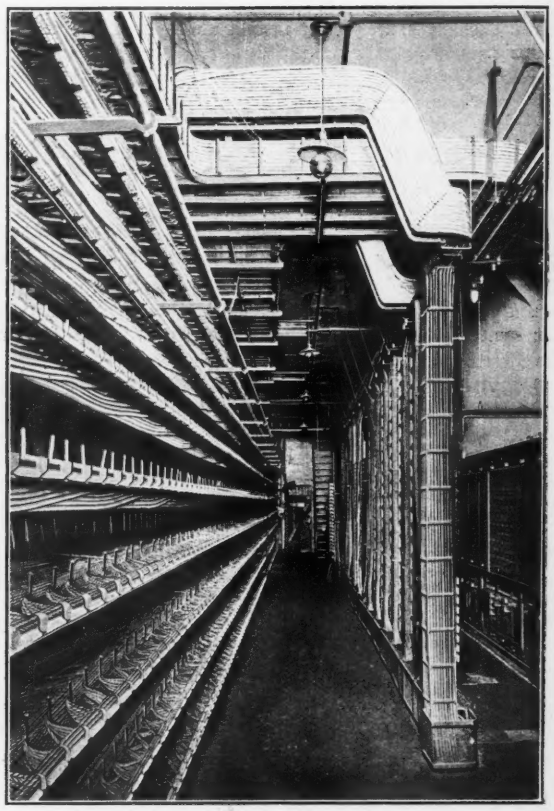


Fig. 7.—Dresden: Main Distributor, and Relay Frame for Additional Switchboards. (See p. 912.)

same term of years. What is the explanation? The representative of the special works concerned states that the reason lies in the education of the officials employed by the authorities. These officials, it is declared, have frequently been obtained from the offices of the largest firms; they are familiar with the latter's plant and materials, and their former relations with the firms are maintained and cultivated. If, however, the higher municipal officials were to occupy themselves closely with the question and inquire into the methods according to which orders are placed, it is considered that a change might take place. But as long as the State and the municipal authorities do not follow the principle of awarding a definite percentage of orders to the special works, the subordinate officials will continue the more convenient policy of ordering everything possible from the largest firms. It is scarcely necessary to say that the Association of Special Electrical Works has never proceeded so far as to suggest for its constituents as a body the allocation of orders in the way proposed by one of its members in his individual capacity, and it is doubtful whether the Association would consider it advisable to put forward what would appear to be a demand impossible of fulfilment.

The installation contractors, who have hitherto been considered to be affected by the competition of the largest firms in installation work to the same extent as the special works in the manufacturing branches, are stated by the representative of the special works in question to be also partly responsible for the special works being pushed into the background. Why? The answer given is that the contractors preferably purchase motors and apparatus in the

warehouses of the largest firms, because they are granted long-term credits, whilst at the same time the prejudice occasionally shown by the public against manufactures other than those of the largest firms has created the idea among contractors that they will obtain more favourable prices and more easily conclude business if they are called upon to procure machines and apparatus from the largest firms. In this way it is considered that many installation contractors are merely agents of the largest firms; yet the latter attach great value to the promotion of their own installation departments, and thus compete with the ordinary contractors, whereas the special works, it is said, do not engage in the installation business. It is therefore contended that unless the contractors do more to support the special works, they will discover the lasting mistake they have made when the special works have ceased to exist. The latter, however, possess a large amount of vitality, and are very remote from the stage of being supplanted by the big firms. Not only so, but their position should become stronger with a continuance of the work of organisation and enlightenment which was commenced some time ago under the auspices of their own particular Association.

NOTES.

(*Continued from page* 910.)

Is Aluminium Diamagnetic?—A correspondent recently asked if we could tell him whether aluminium was diamagnetic or not; much to our surprise, after a prolonged search, we have not been able to find any reference to the matter in any of the standard works that we have consulted. The magnetic properties of alloys containing aluminium have been investigated, and we have no doubt that those of the pure metal have also been examined—perhaps one of our readers will favour us with a reference covering the point.

Electricity Supply Rifle League.—An interesting shooting match took place on the range of the Central Electric Rifle Club at St. John's Wood, on Saturday last, between teams representing the above League and the North-West Middlesex League. A match last year, on the Alperon range, resulted in a win for the Middlesex men by 25 points, and the Electricians hoped to reverse this result, but failed, being defeated by 16 points. The scores were as follows:—

N.W. Middlesex League.		*Electricians.*	
Wheatland	100	Mathews (Hackney) ...	99
Iggulden	99	Harlow (City Co.)	98
Watts	99	Cope (Central)	97
Busby	98	Foster (Shoreditch) ...	97
Gobby	97	Beaton (St. James's) ...	96
Knight	97	H. Pearman (Westminster)	96
Calcott	96	Horley (do.) ...	95
Chinn	96	Hocking (St. James's) ...	95
Cowan	96	Harrison (Shoreditch) ...	95
Churms	94	Hilling (Hackney)	94
Ingram	94	Mugford (Brompton) ...	93
Sussex	94	Beale (do.)	89
	1,160		1,144

New School and Institute at Woking: Apparatus Needed.—A further development in the provision of secondary and technical education has been made in Surrey by the erection of a Secondary School for Boys and Technical Institute at Woking. This school has been provided by the Surrey County Council and the Woking Urban District Council at a cost of approximately £30,000, including the site and equipment. The secondary school provides accommodation for 200 boys, and in the arrangement of the curriculum special regard will be paid to the industrial requirements of the district, while provision will also be made for the preparation of boys for the Universities and for professional and business life. The buildings comprise an assembly hall, separate groups of class rooms for the Secondary School and Technical Institute respectively, together with physical and chemical laboratories, art rooms, workshops for electrical work, wood and metal work, plumbing, &c. Evening classes will be organised at the Technical Institute at which advanced instruction in technical, commercial, art and domestic subjects will be given. The building will be ready for occupation in the autumn term, 1914, and from a personal inspection, under the guidance of Mr. Patrick White, C.C., chairman of the Woking Education Committee, and Mr. Ivor Moore, chairman of the Higher Education Committee, we can state that it seems in all ways well adapted for the purpose.

The opening ceremony will be performed on Wednesday, June 15th, by Lord Moulton, a Judge of great distinction upon the Bench whose interest in numerous cases, when he was practising at the Bar, brought him intimately into touch with those connected with electrical affairs.

We commend this new Institute to the attention of British manufacturers. The need for electrical and engineering equipment affords our firms an opportunity not only for rendering valuable assistance to a very deserving object, but for familiarising the younger generation with their names and manufactures. Every up-to-date firm knows the advantage of having a permanent advertisement in a public institution where it will be brought under the notice of a continuous stream of young and impressionable minds. We are glad to remember the great readiness with which British firms responded to the invitation published in these pages to assist the Hong-Kong University, and as we shall show in our next issue, the past year has been occupied in unpacking hundreds of cases of British goods which will permanently advertise those firms and their wares in the Far East.

The appeal from Woking is somewhat different in character, and its requirements are comparatively small. Its total needs could be very readily met by a few well-disposed firms each doing a little. We understand that the equipment required is as under, and offers and other communications relating to the matter should be addressed to the Editors, ELECTRICAL REVIEW, 4, Ludgate Hill, E.C.:—

Wireless apparatus—A.C. and D.C.
Apparatus for electricity and magnetism (frictional and voltaic electricity and magnetism) for the Physics Laboratory.
One 4-B.H.P. electric motor (single-phase, 100 periods, 200 volts).
One each 6-in. and 4½-in. centre sliding, surfacing and screw-cutting lathes.
One pillar type drilling machine (up to ¾-in. hole).
One 8-in. stroke pillar shaping machine.
One Miller's Falls type power hack saw.
One emery grinder.
One 30-in. × 30-in. marking-off table.

Institution and Lecture Notes.—ASSOCIATION OF TEACHERS IN TECHNICAL INSTITUTIONS.—To-morrow the annual conference of the Association is to be opened at Liverpool, and it will continue in session until next Wednesday. The meetings will be held at the Central Municipal Technical School, under the ægis of the Education Committee of the Corporation. The programme, which is obtainable from Mr. T. J. Roberts, Technical School, Byrom Street, Liverpool, gives much interesting information regarding the Association and its work, as well as about the commercial position and the progress of technical education in West Lancashire and Cheshire.

INSTITUTION OF ELECTRICAL ENGINEERS.—At the annual general meeting of the YORKSHIRE LOCAL SECTION, on May 20th, in addition to the Members of Committee whose election was announced in our last issue, Mr. E. A. Barker was elected.

ILLUMINATING ENGINEERING SOCIETY.—On Thursday last week Mr. A. P. Trotter read a paper on the nomenclature and definition of photometric magnitudes and units, in which he discussed certain definitions submitted to the Illuminating Engineering Society of New York by a sub-committee in 1912. Whilst admitting the scientific accuracy of the report in question, Mr. Trotter criticised the terminology and the choice of units, which he considered by no means simple or comprehensible to the inexpert. For the fundamental unit he preferred the "candle," without any reference to flux density or solid angles. For the unit of illumination he favoured the foot-candle, and he pointed out the importance of "surface brightness" as a definite quantity, whereas the definitions recognised only the brightness of a source of light. In the author's opinion mean horizontal candle-power was the natural term to be used by manufacturers in testing and marking lamps, but he made an exception in the case of arc lamps, where the choice lay between spherical and hemispherical measurement.

Regarding symbols, Mr. Trotter remarked that general rules in symbology always failed as soon as they were propounded, and compared current practice with the proposals of the I.E.C. and other authorities.

MANCHESTER STEAM USERS' ASSOCIATION.—The annual report of the Committee of Management for the past year states that the membership was 2,138, and that 10,079 boilers were under inspection in 1913; the revenue was £20,994, the net balance to credit being £1,461. The reserve fund now stands at £46,527. No boiler under the Association's care burst during the year, and, after 59 years, no life has yet been lost from the explosion of any boiler which the Association has inspected and guaranteed as safe.

ROYAL SOCIETY.—On Thursday last week the Hon. R. J. Strutt read a paper on "Luminous Vapours Distilled from the Arc." Dr. G. W. C. Kaye and Mr. W. F. Higgins read a paper on "The Emission of Electricity from various Substances at High Temperatures."

ASSOCIATION OF MINING ELECTRICAL ENGINEERS.—A joint excursion was made on Saturday last to Grassmoor Collieries by members of the Notts. and Derbyshire Branch of the Association of Mining Electrical Engineers and the Midland Branch of the National Association of Colliery Managers. The visit had been arranged principally to make an inspection of a large electric generating plant driven by gas engines operated from the by-product coke ovens, and also an electric safety lamp charging and cleaning station.

Fatality.—A correspondent states that Percy Llewelyn, aged eight years, was playing in the timber yard at Bridgend on the 23rd inst., and playfully took hold of a wire on which to hang and swing. The wire was a live one from an electric station, and the boy exclaimed "Oh!" and died immediately.

Tramway Congress.—The annual congress of the Tramways and Light Railways Association is to be held at Newcastle-on-Tyne on July 16th and 17th. Headquarters, Central Station Hotel.

Inspection of Electrical Installations.—Proposals await the final sanction of the Montreal City Council for the appointment of an electrical inspector with wide power over the existing and future electrical installations in the city. In the regulations concerning his duties, as drawn up by the City Solicitor, it is stated that all installations and alterations to installations are to be inspected and approved by him before being put into use. The inspector is to be the final authority as to the way in which the work has been carried out, and his instructions are in every case to be obeyed. An elaborate system of fees to be charged is given, the minimum being 50 cents (2s. 1d.) for an installation of five lights, and for any motor $1 (4s. 2d.), an electric sign $1 (4s. 2d.), with increases for extra points. The penalty for non-compliance with the rules and regulations is a fine of $50 (£10), or imprisonment for one month. We often think that matters, as regards inspection formalities, are bad here; after reading these rules, we can only be thankful that we do not live in Montreal.

Appointments Vacant.—Lecturer in the Department of Mechanical and Electrical Engineering in the Municipal Technical Institute, Belfast (£180); lineman (overhead), for Oldham Corporation Tramways. Particulars are given in our advertisement pages to-day.

The *Melbourne Age* for April 16th stated that owing to the expansion of business in the electrical branch of the Postal Department, it had been determined to appoint an assistant to the chief electrical engineer for Victoria. Applications were invited from persons competent to fill the position. The salary was to range from £528 to £600 per annum. Persons outside, as well as inside the service, were eligible.

German Enterprise.—It is reported that an information bureau has been organised in Hamburg, for the purpose of providing expert information on technical subjects of all kinds, free of cost, with a view to the advancement of the German manufacturing industry. At the "German Expert Office" a number of technical experts, who are also accomplished linguists, are employed, and catalogues, records of works carried out, particulars of new inventions, &c., are stored there. The scope of the bureau appears to be very wide, and it will no doubt be of great assistance to German industry. A similar office in this country, which might be attached to the Commercial Intelligence Department of the Board of Trade, would be no less effective in promoting the welfare of British industry.

Educational Notes.—LONDON UNIVERSITY.—Prof. E. G. Coker, M.Inst.C.E., has been appointed as from September 1st to the University Chair of Civil and Mechanical Engineering, tenable at University College. He is President of the Engineering Section of the British Association this year.

ROYAL INSTITUTION OF GREAT BRITAIN.—Prof. Silvanus P. Thompson, F.R.S., will, at 3 o'clock on Thursday, June 4th, begin a course of two lectures on "Faraday and the Foundations of Electrical Engineering." Particulars are given in our advertisement pages.

On Friday last Sir J. J. Thomson formally opened the new Science Laboratories of King's College School, Wimbledon.

Smoke Abatement.—At the first meeting of the Smoke Abatement Committee, Mr. J. Hurst stated that the Coal Smoke Abatement Society had established a scheme for training stokers. The Society reported on the average about 1,350 smoke nuisances each year, as the result of one inspector's observations. He thought that the L.G.B. should deal with smoke abatement, and should be given power to enter premises. West Ham was described as very bad, whilst Hampstead and Lewisham were free from black smoke.

Trans-Atlantic Wireless Telegraphy.—On Wednesday last week the completion of the wireless station at Cefndu, near Carnarvon, was celebrated by a banquet to Mr. Marconi. The station will be opened in a few weeks for direct wireless communication with the station at New Jersey, near New York, U.S.A.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—At the Hove electricity works, on May 23rd, MR. C. BOTTOMLEY SMITH, M.I.E.E., the chief engineer, was presented with an illuminated address, together with a gold chronograph and sovereign-case, by the staff of the Hove Electric Lighting Co., Ltd., on the occasion of the transfer of the electricity undertaking from the company to the Hove Corporation, as a token of the respect and esteem in which they have held him during the whole period of 21 years of the company's tenure.

Prior to his leaving to take up the duties of assistant mains superintendent at Yoker Station under the Clyde Valley Electric Power Co., MR. A. D. COOK, who acted in a similar capacity for the Aberdeen Corporation, was entertained to dinner in the Station Hotel, Aberdeen, and presented with a gold albert from the staff. In the absence of Mr. Bell, city electrical engineer, Mr. McKay, mains superintendent, presided, and, in presenting the gift expressed the sentiments of those present when he indicated their regret at Mr. Cook's leaving, and wished him every success in his new post. Mr. Cook suitably replied.

MR. BERNARD MUNTZ has been appointed assistant to Mr. H. L. Elward, the engineer-in-charge of consumers' connections under the Dublin Corporation electricity department.

MR. R. W. ROWLAND HILL, who has been appointed engineer and manager for the Colne Valley Electric Supply Co., Ltd., will be pleased to receive manufacturers' catalogues, &c.

Tramway Officials.—The Glasgow T.C., it is proposed, are to be represented at the eighteenth Annual Conference of the International Union of Tramways and Light Railways, to be held at Buda-Pesth in August, by Mr. James Dalrymple, the tramways manager; Mr. John Lindsay, town clerk; and two members of the Tramways Committee to be afterwards chosen.

MR. HAROLD PUGH, on vacating the position of chief inspector under the Kidderminster Tramways Co. to take up the post of traffic inspector at Sheerness, was presented with a Gladstone bag and walking stick.

General.—The Tramways and Electricity Committee of Leicester T.C. has recommended the payment of an honorarium of £500 to the borough surveyor in respect of special services rendered in connection with the tramways.

Owing to ill-health, ALDERMAN C. F. BENNETT has resigned the position of chairman of the Sheffield Corporation Electric Supply Committee. COUNCILLOR T. G. EVANS has been appointed to succeed him.

Obituary.—SIR JOSEPH WILSON SWAN.—We deeply regret to learn that Sir J. W. Swan, F.R.S., died on Wednesday at his residence, Warlingham, Surrey, in his 86th year. An account of the celebrated inventor's life and work appeared in the ELECTRICAL REVIEW of November 24th, 1904, and the most recent photograph obtainable of him was published in the REVIEW for November 7th last year, on the occasion of his 85th birthday.

"One Who Knew Him" writes:—On October 31st, 1828, at Sunderland, was born Joseph Wilson Swan, son of John Swan and Isabella Cameron. On May 27th, at Warlingham, Surrey, in the eighty-sixth year of his age, he passed away. Few men have done so much in so, comparatively speaking, brief a period. Few have died leaving the world so much in their debt; few have had their greatness recognised so appreciatively during their lifetime. His discoveries added greatly to the wealth and comfort of Humanity, and it is pleasant to feel that whilst he lived the world was not grudging of praise and thanks for the labours he wrought.

To most he will be familiar as a tall and somewhat austere-looking old gentleman, with a kindly voice and a gentle manner. His appearance led one at first sight to expect brusqueness, even severity. But a moment's conversation and one knew one was in the presence of one who tempered the mildest of justice with the utmost of mercy. He would overlook a fault in anyone but himself; he would never give another a task could he help it, but would always carry out the work himself if circumstances permitted. In his case, at any rate, it is not "De mortuis nil nisi bonum," but it is that there lives no one, has lived no one, who could say an unkind word, or think an unkind thought against the white-haired old man who, in spite of his knighthood, was always known in their hearts, by those who loved him best, as "Old Dr. Swan."

He was not the product of an educational system. He had but little of what is termed "schooling," but what he had he learned thoroughly, and he added to the things that were taught him at school, all that he could read in books. An elementary work on chemistry which fell by chance into his hands was largely instrumental in shaping his career. He studied book after book on the subject, which fascinated him, and at length he succeeded in getting apprenticed to a firm of manufacturing chemists. Shortly after he made the acquaintance of John Mawson, a chemist, and he entered into partnership, and before long made John Mawson his brother-in-law. The two built up a successful business at Newcastle, and as soon as his hard work left him leisure to do so, young Swan studied photography, which was then truly in its infancy, went closely into the work of Daguerre and Fox-Talbot, and eventually invented the autotype or carbon process of photography, and finally gave to the world the modern dry plate, which enabled the science to progress at a hitherto unimagined rate.

But it is in connection with the incandescent electric lamp that the dead scientist was best known. There is but little record of the early experiments he carried out, but it is known that the germ of the idea which was to grow into so great a reality was placed in his mind at a lecture given by Mr. E. Staite on electricity, at which the lecturer, amongst other demonstrations, heated to whiteness a wire of an alloy of iridium and platinum by means of an electric current. "If this could be done in the open air, why could not it be done in a glass bulb so as not to damage anything which came in contact with it?" And so the years of experiment began, first with wire, then with paper slips—with which, by the way, some fairly serviceable lamps were made—and then with parchmentised cotton threads. The question of obtaining a sufficient vacuum in the containing bulb delayed the introduction of the lamp on a commercial scale for some time, but at length the difficulties in this connection were fairly well overcome, and the first lamps, with cotton thread filaments, were put on the market. Almost directly after Mr. Swan devised and patented the making of filaments by a process of squirting nitrocellulose through glass jets into a bowl of some coagulating liquid.

In the earlier lamps some trouble was experienced, as in the early days of the metal-filament lamp, by the vacuum becoming impaired by occluded gases, and this trouble was got over by an ingenious method of heating both the filament and the containing bulb during the process of exhausting. Difficulties were also experienced in connection with the mounting of the filaments, and particularly in attaching them to the leading-in wires.

Amongst other inventions of Sir Joseph Swan may be mentioned that of the cellular lead plate for storage batteries and a useful miner's safety lamp, in which an incandescent Swan lamp was used in conjunction with a small accumulator. He also did much to improve the half-tone process of photography.

In 1894 he was elected a Fellow of the Royal Society, and he was President of the Institution of Electrical Engineers for 1898-9. He was also an Honorary Member of that body. In 1900 and 1901 he was President of the Society of Chemical Industry, and for his services to science he was knighted in 1904. He received the honorary degrees of M.A. and D.Sc. of Durham University, and held the Hughes Medal for Scientific Discoveries. He also received the Medal of the Society of Chemical Industry, and was a Chevalier of the Legion of Honour.

The world, it is true, is greatly the poorer by his death, but it is nevertheless true that it is greatly the richer by his life, and that is as fine an epitaph as can be written.

MR. ALFRED R. SILLAR.—We learn with deep regret that news has been received by cable of the death on May 20th, at Peking, of Mr. Alfred R. Sillar, brother of Mr. A. M. Sillar, the well-known consulting engineer of Westminster. Mr. Alfred R. Sillar was, in his early days, with the Electrical Engineering Corporation and Messrs. J. G. Statter & Co., and afterwards with Messrs. Siemens Bros., for whom he had charge of the town lighting system at Colchester. He was appointed borough electrical engineer for Colchester in 1900, and he held that position, supervising the construction and equipment of the tramways until 1911. In that year he was appointed chief engineer to the Chinese Chartered Electric Co., at Peking, and he has been in charge of the lighting there during the very troublous times of the Revolution, and of the subsequent rapid extensions due to the opening of the forbidden city. The deceased gentleman was expected in England this summer to arrange for extensions of the plant, but recent news showed that the present Government was cancelling the concession of the company (a purely Chinese one), and arranging to give it to a French company. This action of the Government led to indignation meetings of shareholders, but what has happened between then and May 20th, the date of Mr. Sillar's death, is unknown in this country. Our readers will remember several interesting articles which have appeared in the ELECTRICAL REVIEW during the last few years from the pen of Mr. Sillar on the subject of British electrical trade in China.

NEW COMPANIES REGISTERED.

London Association for the Protection of Trade, Ltd. (135,754).—The London Association for the Protection of Trade, which was established in 1842, resolved at its seventy-first annual meeting that it was advisable to incorporate the Association as a company limited by guarantee, each member of the company being made liable for 1s. in the event of winding up. The Association was duly incorporated, pursuant to such resolution, on May 12th. The preamble to the "Rules" states that, in order to counteract "the numerous frauds, deceptions and thefts to which the traders of the Metropolis had long been exposed, and the very great increase of those malpractices," the Association was formed in 1842, its objects being *inter alia* to aid in preventing such fraud and deception, to furnish status information, to legally assist members who had been swindled, to collect debts, &c. "To aid in these objects, it is required that every member will, immediately after the attempt or perpetration upon him of any fraud, theft or deception, report to the Secretary the particulars of the offence, with the known or supposed name and address of the offender, and a description of his or her person." The present managers are 40 in number, comprising representatives of 12 firms in London and 28 in the West of England (mostly Exeter and Plymouth). Among the managers are:—H. Faraday (Faraday & Son), 146-150, Wardour Street, W., electrical fittings merchant; A Moore (F. Braby & Co., Ltd.), 353-363, Euston Road, N.W., engineer; J. T. Osler (F. & C. Osler, Ltd.), 100, Oxford Street, W., electric light fittings and china merchant, &c.; T. L. Harding (T. L. Harding & Sons), Torquay, wholesale ironmonger; T. Bradley Rowe (Rowe, Bros. & Co., Ltd.), Exeter, lead, glass and oil merchant; J. Row (Wippell Bros. & Row), Exeter, furnishing ironmonger; J. F. Winnicott, J.P., C.C. (Winnicott Bros.), Plymouth, hardware dealer. The registered office is at 66, Berners Street, W.

Electric Floor Machine Co., Ltd. (135,862).—This company was registered on May 18th, with a capital of £3,000 in £1 shares (1,000 preference), to carry on business as manufacturers and producers of rotary or other floor surfacing, planing, scrubbing and polishing machines, to enter into contracts for the surfacing, planing, scrubbing and polishing of wooden floors, stonework and surfaces, &c.; to acquire the undertaking, goodwill, assets and contracts of H. R. Wilson, of 118, City Road, E.C. The subscribers (with one share each) are:—H. R. Wilson, 118, City Road, E.C., electrician and engineer; R. Bence-Jones, D.L., J.P., 4, Cliveden Place, Eaton Square, S.W. Private company. The number of directors is not to be less than two or more than four; the first are H. R. Wilson and R. Bence-Jones, D.L., J.P. (chairman), both permanent; W. Symons is first secretary; qualification of permanent directors, 500 shares; of ordinary directors, 300 shares; remuneration of H. R Wilson and R. Bence-Jones, as joint managers, £5 per week in addition to directors' fees. Registered office, 86, Hatton Garden, E.C.

Photo-Telegraph and Cable Co., Ltd. (135,976).—This company was registered on May 22nd, with a capital of £5,000 in 4,500 preference shares of £1 each and 10,000 deferred shares of 1s. each, to adopt agreements (1) with T. T. Baker, (2) with Otto Fulton, (3) with the Directors' Registry, Ltd., Otto Fulton, T. T. Baker, H. J. de la Condamine and the Pictorial Telegraph Syndicate, Ltd., and (4) with the Directors' Registry, Ltd., to acquire and turn to account any patents for inventions relating to "photo-telegraphy," &c. The subscribers (with one deferred share each) are:—W. H. Drummond, 4, Whitehall Court, S.W., barrister; Otto Fulton, Woodlands Park Road, East Twickenham, S.W., scientific expert. Private company. The number of directors is not to be less than three or more than seven; the first are Otto Fulton, W. H. Drummond and C. H. Parker. Registered office, 100, New Bond Street, W.

United Cablegram Co. of France, Ltd. (135,940).—This company was registered on May 20th, with a capital of £25,000 in 5,000 7 per cent. cumulative preference shares of £1 each, and 80,000 ordinary shares of 5s. each, to carry on the business of a telegram and cablegram agency in France, the French Colonies and Dependencies or elsewhere, to construct or work telegraphs and telephones, to carry on the business of advertisement contractors and advertising agents, &c. The subscribers (with one preference share each) are:—C. A. Shepping, Hotel Astor, New York City, publisher; G. Fyall, 20, Copthall Avenue, E.C., gent'eman. Private company. The number of directors is not to be less than two or more than seven; the subscribers are to appoint the first: Lieut. R. Tindal, R.N., is the first secretary; qualification, 100 shares. Registered office, Trafalgar House, 11, Waterloo Place, S.W.

Samuel Booth & Co., Ltd. (135,078).—Registered May 22nd, by Waterlow Bros. & Layton, Ltd., Birchin Lane, E.C. Capital, £50,000 in £1 shares (25,000 preference). Objects:—To take over all or part of the undertaking and assets of the business of a manufacturer of and dealer in gas and electric light and water and steam fittings carried on by J. Booth, at Birmingham and elsewhere, as "Samuel Booth & Co." The signatories (with one share each) are:—J. Booth, Cheapside Works, Birmingham, gentleman; R. A. Pinsent, 6, Bennetts Hill, Birmingham, solicitor. Private company. The directors are to number not more than five. J. Booth is first permanent governing director and chairman, with £350 per annum. J. Booth will appoint C. W. Blount, F. A. Ford, E. J. Garlick and A. H. Mullings as "departmental directors."

T. W. Vaughan & Co. (1914), Ltd. (135,961).—This company was registered on May 21st, with a capital of £5,000 in £1 shares, to take over the business of electric lighting, heating, ventilating and general engineers, and art metal workers, carried on by T. W. Vaughan & Co., Ltd. The subscribers (with one share each) are:—F. C. Stark, Stroma, Malford Grove, Snaresbrook, Essex, contractor; R. Long, St. Ives, Wynndale Road, South Woodford, accountant. Private company. The number of directors is not to be less than two or more than four; the first are F. C. Stark and R. Long; qualification, 50 shares; remuneration as fixed by the company. Registered office, 22, Cross Street, Islington, N.

"Sprite" Cleaner Co., Ltd. (135,981).—This company was registered on May 22nd, with a capital of £100 in £1 shares, to carry on the business of manufacturers of and dealers in vacuum cleaning apparatus, mechanical and electrical engineers, &c. The subscribers (with one share each) are:—R. S. Turner, Bromford Lane, Erdington, Birmingham, private secretary; E. Willan, 83, Hazelwood Avenue, Newcastle-on-Tyne, clerk. Private company. Table "A" mainly applies. Secretary, E. Willan; solicitor, C. G. Mitcheson, 42, Grey Street, Newcastle-on-Tyne.

Bachelet Levitated Railway, Ltd. (135,989).—Registered May 23rd, by Waterlow Bros. & Layton, Ltd., Birchin Lane, E.C. Capital, £105,000, in 100,000 ordinary shares of £1 each, and 100,000 vendors' shares of 1s. each. Objects: to acquire and turn to account any invension relating to transportation by levitation by the use of electricity, and of any apparatus therefor, and to adopt agreements (1) with Major T. P. Carington Smith and Chas. Vane for the acquisition of the patents referred to therein; and (2) with Emile Bachelet. The vendors' shares confer the right to two-thirds of the distributed profits and to two-thirds of any surplus assets in the event of winding up. The signatories (with one share each) are:—E. Alderton, 42, Piccadilly, W., gentleman; G. S. Brockelbank, Stock Exchange, E.C.; C. Vane, 11, Waterloo Place, S.W., gentleman; R. G. J. Wightman, 11, Waterloo Place, S.W.; G. A. Banks, 11, Waterloo Place, S.W., clerk: F. B. Fowler Addiscombe Court Road, Croydon, journalist; C. J. Wightman, The Elms Sherwood Park Road, Sutton, Surrey, traveller. Minimum cash subscription 20 per cent. of the shares offered to the public. The directors are to number not less than three or more than nine; no persons had consented to act as directors to May 22nd; F. B. Fowler is the first secretary; qualification £500; remuneration (except managing director), £200 each per annum chairman, £300.

CITY NOTES.

Kent Electric Power Co., Ltd.

AT the annual meeting, held on May 13th, Mr. J. F. ALBRIGHT, in moving the adoption of the report (see ELEC. REV. p. 837), said the revenue for the year showed an increase of £1,660 over the previous year. They had, in common with other companies, incurred a great increase in working expenses, largely due to the very abnormal price of coal and to the increase in wages and rates and taxes, and especially insurance. A new contract for coal had been made at a much lower figure than that paid last year. Reference was made in the last annual report to the passing of the Kent Electric Power Act, 1913, under which their issued ordinary share capital was reduced from £225,004 10s. to £64,000, though the priority share capital had not, of course, been affected. This had enabled the directors thoroughly to overhaul the balance-sheet and to put it into a simple and concise form, so as to show the true state of the company's affairs. They were now in a position to recommend the payment of the full dividend for the year 1913 on the 6 per cent. cumulative, priority shares, together with all arrears. As it was very undesirable to deplete the company's available cash resources, the directors invited the holders of these shares to invest the amount of the dividend in taking up further priority shares at par, and practically the whole of the shareholders had agreed to do so. Further capital was urgently required for additional plant, machinery, and mains to meet the needs of the rapidly-increasing business, and they had been able to issue 15,000 further priority shares for cash, in addition to the provision of £16,500 in Lloyd's bonds, carrying interest at the rate of 6 per cent. per annum. The company was now in a sound and healthy condition, and looked forward with confidence to the future. A resolution was passed authorising the issue of additional shares to the nominal amount of £7,237, being the balance of an issue of £50,000, such shares to form a separate class to be called priority shares.

Devonport and District Tramways Co.—After transferring £1,500 to reserve, a dividend of 1 per cent. is recommended for the year ended at December, 1913, leaving £413 to carry forward.

Mackay Companies.—The directors announce the usual quarterly dividend of 1¼ per cent. announced on common shares.

Lancashire Power Construction Co., Ltd.

THE annual meeting was held on May 21st at the offices, Salisbury House, London Wall, E.C., Dr. H. F. PARSHALL presiding.

The CHAIRMAN, in moving the adoption of the report (ELEC. REV., p. 874), stated that the classes of supply dealt with by the Parliamentary Co. had steadily increased. The Salford Corporation bulk supply contract did not, however, benefit the accounts to any considerable extent as the supply was not commenced until October, and then only on a small scale. A much larger supply was now being taken. Salford Corporation had a big installation of their own, but were not so favourably situated as that company in regard to the power house, so that the Lancashire Power Co. could sell them power at a profit to themselves for less than Salford could generate it at. That was really the strength of their position—they were selling power at a profit to themselves at less than most of the local authorities could produce it for. That was a great satisfaction in the case of a company like themselves, because they knew that when any question arose the local authority always had the preference and the interests of the power company were always second in the eyes of Government departments. They had rather an unpleasant experience of that during the last year. Heywood, which was a small local authority situated in a district that they could conveniently supply, were showing a heavy loss last year and could not profitably increase their electrical generating facilities. They applied to that company for a supply, and the company gave them a price which was practically the same that Salford found a favourable price, Salford being supplied with several million units and Heywood with a comparatively small quantity. The company were able to give Heywood the smaller supply on favourable terms as they were on the route of several local authorities requiring a supply. The company had no preferential system of charging, so that they would not give any local authority a price which would put their previous contracts in an unfavourable light. That was to say, even if Heywood were the most desirable of customers the company would not do anything to prejudice Salford or *vice versa*. Well, Heywood were neighbourly with Bury Corporation—a corporation the company encountered in the case of the Local Government inquiry at Radcliffe. Bury had an electric undertaking of their own, and it was not very dissimilar to a great many other local authorities inasmuch as they had converted what was a substantial profit into a substantial loss by undertaking to sell electricity at a lower figure than the cost of production, thinking that if they sold enough they would eventually sell at a profit. When Bury got in touch with Heywood they gave them a kind of sliding scale. Nobody knew what the eventual price would be, but it was a good thing to juggle with when they were dealing with the Board of Trade. After some considerable correspondence, in which the company showed that they were not only ready but willing and desirous of giving a supply to Heywood, and on terms which were extremely favourable, the Board of Trade thought it was a proper matter for a hearing, although if it had been the other way about the directors were perfectly satisfied that it would not have been a proper thing for a hearing. Having had some experience of this sort of thing, the company employed Mr. Honoratus Lloyd, K.C., one of the first counsel on electric light law. He said the proposition was nothing short of monstrous, and he could not understand why any local authority under such conditions could ever hope to supply electricity in the area of a power company. However, the company had its hearing, and at the hearing it came out that Heywood had no fixed price. They lived on hope and expectation that the price would be lower than that of the company. The company showed that if Bury gave a price which was as low as that of the company it would increase their present losses, and it was proved that they were proposing to supply Heywood at a price lower than they were charging their own customers in their own area, and that that was being done at the expense of the users in their own area. In other words, that supply was being given at the expense of the ratepayers in the Bury area. The Board of Trade had a protracted hearing, and they apparently found, according to precedent, as far as they could see, that they had to give the decision to the company, but, unfortunately, the company did not have so many votes as the local authority, so they called in various legal advisers and various other people to relieve the Board of Trade of any responsibility as to any decision reached, and in the final outcome Mr. Burns put his guinea stamp on a document saying the company had been unreasonable in not allowing Bury to give a supply in the company's area. The result of this decision was that other areas beyond the Bury area would be deprived of a supply, since without the Heywood supply the cost of mains to reach these areas would be excessive. The directors felt they must resist this to the fullest extent. In their opinion the power companies must in so far as was possible try to be mutually protective, and they thought that if such a decision was to be given it must affect some of the other power companies very seriously. They felt they must resist the decision to such an extent that they could not be held up and pointed at by the other power associations as the horrid example which allowed such a precedent to be created. Their present position was that it had been held in the Courts that a Government department could not give a decision *in camera*, and that they had got to lay all the documents before both parties in the case, and their position was that if the law of the land held good under present conditions they would see on what that decision was founded. That was the principal event of an unpleasant kind that had occurred. So far as they were concerned it was fundamentally wrong, but it made people wonder whether or not an Act of Parliament was any protection at all. Certainly under some conditions it appeared that Parliament made laws which were meant to be broken and not to be kept. He thought the general result in the balance sheet would appear to be good when they saw, as he had said, that they had made £22,785 profit, which was twice what the fixed charges were. They were able to put the company on a solvent basis, and in the future, with the increasing profit which it would seem reasonable to expect, all those who had invested money in the company should feel satisfied that they would have a reasonable return.

Sir ROBT. A. HAMPSON seconded the resolution, which was carried unanimously.

Electric Construction Co., Ltd.

MR. P. E. BEACHCROFT presided on May 21st at Winchester House, E.C., over the annual meeting.

In moving the report (ELEC. REV., p. 833) the CHAIRMAN said that in accordance with the resolution passed at the last annual general meeting the report and accounts covered a period of ten months only. Last year he was able to report that they had handled an increased output at comparatively little additional cost for fixed charges, and he was in the happy position to make a similar announcement that day. The gross profit on manufacturing and contracting for the past ten months was £57,546, as compared with £62,669 for the previous twelve months, being an increase of 10.2 per cent. per annum. The general charges for the ten months amounted to £18,324, as compared with £21,816 for the previous twelve months, an increase of 0.8 per cent. per annum only. They had, relatively, however, spent more on maintenance of plant and buildings, but this was due to a considerable amount of demolition rendered necessary by the extensions. The expenditure shown under the heading of maintenance of plant and buildings included nothing for the renewal of loose tools, which formed a very heavy item, but which, in accordance with invariable practice, had been included in factory charges, and, therefore, provided for before the manufacturing profit was stated. In pursuance of their conservative policy they had written off for the ten months for depreciation the sum of £5,000, the amount which they had hitherto appropriated for the full year. Having regard to the high state of efficiency in which the works were maintained out of revenue they considered £5,000 per annum a reasonable provision for the depreciation of fixed plant and machinery, and for writing down patents and goodwill. The amount of net profit for the ten months was £27,126, as compared with £27,501 for the whole of the previous financial year, being an increase at the rate of 18.4 per cent. per annum. This they would consider very satisfactory. Turning to the balance sheet, on the assets side they had spent £9,537 on additions to plant and buildings. This represented an important extension to the works at Wolverhampton, which had become necessary to enable them to cope with the increased demand for their manufactures. By this extension the superficial area of the shops had been greatly increased at a comparatively small cost, and he had not the slightest doubt, when they had completed the equipment of the extension, that a handsome return would be earned on the capital expended. They had a factory second to none in its substantial character, its up-to-date appliances, and splendid organisation. Their stock-in-trade and sundry debtors showed little change, but bills receivable were higher. This did not mean they they had been doing a more speculative business, the bills being all first-rate trade acceptances, but their amount at March 31st happened to be considerably more than the amount of bills they usually carried. On the other side of the balance sheet the special resolution passed last year converting the ordinary and preference shares of £2 each into two shares of £1 each had been given effect to, and the Stock Exchange quotation for the shares had been correspondingly narrowed. The only other change was an increase in the general reserve fund from £35,309 to £46,000, the difference having been provided out of the profits for 1912-13. A cursory examination of the balance-sheet would show that the financial position was unquestionably sound. Their total liabilities, apart from share capital and debenture stock, were only £20,955, whereas their realisable assets amounted to £152,397, and, in addition, they had £19,029 in cash. The only other matter he need mention in connection with the accounts was the general reserve fund, to which they proposed to transfer £12,000 out of last year's profits, increasing the amount at the credit of the account to £58,000. As his predecessors in the chair stated from time to time, they had always looked to this item as specially set aside to meet any deficit in the realisation of their holdings of shares in other companies. These shares were taken over from the old company at valuations which appeared reasonable at the time, but they recognised that it would be highly improbable that they should realise the shares at these prices. Personally, he would rather see the amount standing against shares in other

companies reduced to something like its present real value by the transfer of an amount from general reserve. This would not affect the financial position one iota, being merely a book-keeping entry, and they had to consider whether this should not be done during the current year. In the latter part of the period now under review they experienced some falling off in orders, but this was inevitable. The country had been enjoying a degree of prosperity unequalled in any previous period of their history, and it was contrary to all precedent to imagine that a reaction would not occur. He was glad to note, however, that, in the opinion of those best able to judge, the depression was not expected to be of great intensity or duration. While their business was, of course, affected by the state of trade generally, he was pleased to say that their volume of unexecuted orders was quite up to the average, and he looked to the future with every confidence. The use of electrical energy for power, heating and cooking was still capable of great expansion, and that they should continue to get their fair share of the business in electrical machinery he had no doubt. He visited the works about a fortnight ago and was struck more than ever by the splendid equipment of up-to-date appliances, and by the enterprise and zeal displayed on every side. The amicable relations with their workmen remained undisturbed, and he was pleased to say that during the last year or two many of their foremen and older workmen had become shareholders in the company, thus giving them a direct incentive to do their best to promote the welfare of the concern. To their staff at the works and in London they owed much of their success, and so long as the company was served by men so capable and zealous they need have no fear of maintaining the position in the industry which they had enjoyed in the past.

Mr. James Gray (managing director) seconded the motion and it was carried.

Electric Supply Corporation, Ltd.

The directors' report for 1913 states that the gross earnings amounted to £34,690, an increase of £2,303. The sum taken into net revenue account amounts to £15,655 as against £13,499 for 1912. After paying interest upon debenture stock and the actual cost of the year's repairs and renewals, and adding the balance brought forward from the previous year, there is a surplus of £8,556. The directors have placed £2,100 to the renewals account and are distributing a dividend at the rate of 2 per cent. per annum for the year, carrying forward £2,256.

Year.	Equiv. in 32 Watt lamps connected.	Units sold.	Gross earnings.	Profit, including investments.
1911 ...	172,202	3,070,851	£29,392	£13,167
1912 ...	186,207	3,730,780	£32,387	£13,449
1913 ...	201,266	3,975,091	£34,690	£15,655

The Hendon Electric Supply Co., Ltd., distributed a dividend of 12 per cent. for 1913 and the Dumbarton Burgh and County Tramways Co., Ltd., a dividend of 1½ per cent. upon its ordinary shares. The total amount received has been brought into these accounts.

The company has issued further debenture stock during the year to the amount of £14,000, bringing the total issued up to £154,914.

	Lamps connected. (Equivalent in 32 Watt lamps). 1913.	Increase.
Chelmsford	37,242	4,549
Jedburgh	3,880	252
Melrose	5,138	193
Dalkeith	8,255	250
Dollar	3,214	436
Totnes	6,175	1,116
Exmouth	17,995	2,612
St. Andrews	25,481	1,128
Hitchin	11,217	699
Dumbarton*	65,360	2,793
Falmouth	17,309	1,031
Total increase during 1913		15,059
Hendon	97,636	23,186
Dawlish	2,850	960
North Berwick	681	

*These figures take no account of the supply to the Dumbarton Burgh and County Tramways which used 636,205 units in 1913.

The annual meeting was held on May 20th at Salisbury House, E.C., Mr. J. G. B. Stone presiding.

The Chairman, in moving the adoption of the report, said that the number of lamps connected had increased during the year by over 15,000, as against an increase during 1912 of 14,005, while in addition the Hendon Co., in which that company held a large portion of the capital, had also added the equivalent of 23,186 33-watt lamps. Their capital expenditure during the year had been £4,147, for nearly one-third of which additions to plant at Chelmsford were responsible. The balance was distributed over the rest of their towns, and in most cases represented mains extensions. Their expenditure upon repairs and renewals had been £2,050. This was a heavier contribution from revenue than in the previous year. In addition they proposed to place a further £2,100 to the renewals account to further strengthen the position. During the year they issued £14,000 of debenture stock, and in order to facilitate the sale of this stock, and to increase the marketability of the old stock, powers were obtained to convert registered stock into bearer form. This change had the desired effect, and a number of holders of the old stock had converted into bearer and there had been an active demand for the bearer stock. Referring to their investment in the Hendon Co., the company now held 4,928 shares, as against 3,793 shares last year. Since their last annual general meeting certain transactions had taken place in these shares which had resulted in a profit, the whole of which would eventually go into their reserve against investments. He said "would eventually go into their reserve against investments," for as the transactions extended into the current year only part of the profits were brought into the accounts now before them. The company received during September last their first dividend, amounting to 1½ per cent. upon their holding of ordinary shares in the Dumbarton Tramway Co. They also received dividends during the year amounting to 12 per cent. upon their holding in the Hendon Company. Progress had been well maintained during the year, the gross earnings having risen by £2,300. It was satisfactory to note that this increased output had been effected with an increase of only £800 in their working expenses. This extra expenditure was more than covered by the extra cost of coal. In the year 1912 their coal cost £9,131 as compared with £9,981 in 1913, a difference of £850. The average cost of coal per ton in 1912 was 12s. 5d., and in 1913 it was 15s. 6d. The cost of coal per unit sold in 1912 was .587d. and in 1913 .63d. The company had been disappointed in this matter of coal costs, because 1912 being the year of the strike they thought that they could not have had worse conditions. As it happened, however, they had in 1912 the benefit of several contracts which had been made before the strike, and for 1913 they had to make contracts at a considerable advance in prices. Their coal consumption was at present at the rate of 13,000 to 14,000 tons per annum, but they had made some very important contracts in connection with their Dumbarton business which would nearly halve this figure, by shutting down their generating station in that town. The arrangement was that they were to buy all their electricity in bulk from the Clyde Valley Electrical Power Co., with whom they had made satisfactory terms as to the rates they were to pay. Incidentally, they had secured a very large power consumer in Dumbarton with whom they had made a ten years' contract, and they had also arranged with one of their oldest and largest consumers to renew on satisfactory terms their contract with them for a period of slightly over ten years. Turning to the accounts for 1913 they found that their increased gross earnings of £2,300 were accompanied by an increase in net revenue of £2,200. The directors, however, recommended the distribution of a dividend at the same rate, namely 2 per cent., which would leave a substantial sum to be placed to the renewals account and an increased balance to be carried forward.

Mr. Francis R. Reeves seconded the motion, and expressed the opinion that the shareholders would look with satisfaction upon the state of affairs of the company. They were not going ahead at a very rapid rate, but they were progressing and improving.

Brisbane Electric Tramways Investment Co, Ltd.

The annual meeting of this company was held on May 21st at Winchester House, E.C., Mr. H. R. Beeton presiding.

The Chairman said the total gross receipts for the year 1913 of the Brisbane Tramways Co., all the shares of which the Investment Co. held, amounted to £316,244, and the expenditure, which included an item of £13,381 for law costs, etc., in connection with the proceedings in the Arbitration Court in Australia, amounted to £191,936. The profit, therefore, amounted to £124,308 which, with £5,128 brought forward from 1912, gave an available balance of net revenue of £129,436, of which £10,000 was credited to renewals account, raising that fund to £110,000, and £116,000 was paid in dividends, leaving a balance of £3,436 to be carried forward. After adding to the dividends which had been received on the shares the amount brought forward from last year, and after deducting the London and Brisbane charges, the net balance available was £115,848. A comparison of the figures of the Brisbane Tramways Co. with those for 1912 would be misleading owing to the strike which occurred in that year. The progress of the tramways company based upon that of the City of Brisbane had been very remarkable, as was evidenced by the fact that in the past nine years during which the street mileage over which the company's cars ran had been the same, the gross receipts had increased from £128,436 in 1905 to £315,477 in 1913, while the number of passengers carried had risen from 20,049,978 to 44,690,950, and that improvement continued, the receipts for the first four months of this year showing an increase of £11,095 over those of the same period of last year. The negotiations for extensions of the system had resulted in a settlement satisfactory to the authorities and the Tramway Co., and the company was now constructing 4½ miles of new line, and had applied for construction orders for a further 2¼ miles. The company's application to the High Court of Australia for an Order prohibiting proceedings on the Award made against the company in the Arbitration Court came before the full Court in March last, and after a hearing of several days the preliminary objection of the Australian Tramways Employees' Association to the application, based on the ground that the Court had no power to interfere with the Award, was unanimously over-ruled, and the case would shortly be heard on its merits. The Queensland Government, towards the close of the last Session

of Parliament, introduced a Bill very similar to that promoted earlier in the year by the local authorities—but this was allowed to drop—with a view of constituting a Trust with power to purchase the tramways, in agreement with the Tramways Co., at any time, or, as an alternative, to come to a profit-sharing agreement. That Bill was read a first time in November last, and would come up again in the present Session of Parliament. The directors of the Tramways Co. had no objection, in principle, to either proposition, and if the Bill became law they would be quite prepared to discuss terms, having due regard to the company's present and prospective prosperity. In accordance with the announcement made on the 30th January last, the meeting would that day be asked to pass a resolution sanctioning an increase of capital by the issue of 30,000 ordinary shares of £5 each to be offered at par to the existing ordinary shareholders registered on the books at the date of closing the register, namely, 7th May last, in the proportion, as near as possible, of one new share for every three old ordinary shares held. The right to the allotment of those shares at par, with full rights to dividend for the current year, notwithstanding that the shares would only be fully paid on the 15th October, 1914, represented a considerable bonus to the shareholders, which was, of course, saleable on the market by the shareholders who did not desire to take up their proportion. Allotment letters would be posted that day, and acceptances must be forwarded to the company's bankers on or before the 4th June, 1914, with a deposit of £1 per share. The balance of £4 per share would be payable £2 on the 15th August, 1914, and £2 on the 15th October, 1914, after which date the new shares would rank *pari passu* with the old shares, which would entitle holders to the full interim dividend when declared. He concluded by moving that the report and accounts be received and adopted.

Mr. J. B. Concanon seconded the adoption of the report (Elec. Rev., p. 874), which was agreed to unanimously after a short discussion on matters of detail.

On the motion of the Chairman, seconded by Mr. McIlwraith, the directors were authorised to increase the capital of the company to £975,000 by the creation and issue of 30,000 new ordinary shares of £5 each ranking for dividend and in all other respects *pari passu* with the existing ordinary shares of the company.

West London and Provincial Electric Supply Co., Ltd

The annual meeting was held on Wednesday, May 20th, at 14, Ironmonger Lane, E.C., Mr. Harry Kahn presiding.

The Chairman, in moving the adoption of the report (Elec. Rev., p. 832), said he need hardly remind the shareholders again that the whole of the income of the company was derived from the dividends on its shareholding in the Chiswick Electricity Supply Corporation, together with certain management and engineering fees received from the same source. Under the circumstances the successful working of the Chiswick Corporation was of vital importance to them, and he proposed to give them some detailed figures in reference to that undertaking. In regard to their own balance sheet, the shareholders would see that their net profit of £3,419 was £63 lower than last year, due to the fact that they received slightly less in management and engineering fees. The Chiswick Corporation had made continued progress. During the past year the number of consumers had increased by 188 to 2,606, the revenue by £1,118 to £19,440, and the net profit after payment of debenture interest, trustees' fees and premium on sinking fund policy, by £341 to £4,643. The increase in the net profit was not in proportion to the increased revenue. This was owing chiefly to the fact that the Corporation had had to pay very high prices for fuel, and also to the fact that at times of pressure during the last winter their plant was utilised to its fullest extent, a condition of affairs with which the existing condensing plant was not able to deal effectively. This contingency had been foreseen, for the company had ordered a Diesel engine set which, however, was delivered considerably later than the contract with the makers provided. This set, which was installed at the end of 1913, had been running satisfactorily during the current year and would effect a considerable saving in the cost of fuel, besides enabling the Corporation to cope with the expected increased demand for several years to come. The outlook for the Corporation during the current year was favourable. The net revenue for the first quarter of 1914 showed an increase of over £300, and the second quarter, as far as it had gone, also showed signs of improvement on last year's figures.

Mr. Gerald T. Moody seconded the motion.

Sir Thomas Brooke-Hitching, in supporting the motion, said that there had been a constant increase in the revenue of the company and in the number of consumers from 1910 to 1913. The past had been a record year, and he thought the prosperity of the company would be continuous. The number of empty houses in Chiswick had been reduced by some 60 per cent., and if they could get their electric light into these houses their profits must show a continued increase. There was a large amount of land still to be developed in Chiswick, and when they had more factories there they would feel the immediate results. Altogether the outlook for the West London Electric Supply Co. had never been better, and he hoped that it would show continued prosperity.

The motion was carried unanimously.

Continental Companies.

The Austrian A.E.G.—Union Co.—According to the report for 1913 of the Austrian A.E.G.—Union Elektrizitats Gesellschaft of Vienna, the works were sufficiently occupied in consequence of the large stock of orders brought over from 1912, although the high rate of interest and the slow method of payment by customers had an unfavourable influence on the results. Notwithstanding the improvement which has taken place in this direction, the arrival of orders still continues to be satisfactory. After applying £17,800 to depreciation in 1913 as compared with £15,900 in the previous year, the net profits are recorded at £64,200 as contrasted with £50,400 in 1912. The dividend is at the rate of 8 per cent. on ordinary share capital of £666,000, as compared with 8 per cent. on £500,000 in the preceding year.

Russian Companies.—The accounts of the Russian Siemens—Schuckert Works indicate net profits of £129,740 for 1913. It is proposed to pay a dividend of 6 per cent. as in 1912, but the capital participating is £1,500,000 as compared with £300,000 in the previous year, the increase being due to the amalgamation of the heavy electrical engineering departments of the Russian Siemens and Halske Co. and the Russian Schuckert Co.

The United Cable Works Co., of St. Petersburg, in which the Felten and Guilleaume Co., the A.E.G., and the Siemens and Halske Co. are interested, earned gross profits of £139,922 in 1913 as contrasted with £103,870 in 1912. After allocating £37,637 to depreciation as against £29,661, the balance permits of a distribution of 10 per cent. as compared with 8 per cent. in 1912.

The Russian Siemens and Halske Co. realised net profits of £50,443 in 1913 as compared with £43,638 in the previous year. It is intended to make a distribution of 6 per cent. as in 1912.

German—South American Telegraph Co.—The accounts for 1913 of the Deutsch Sudamerikanische Telegraphen Gesellschaft, of Cologne, after placing £7,600 to depreciation as compared with £5,300 in 1912, show net profits of £62,600, including the balance of £6,400 brought forward, as contrasted with £54,000 in the preceding year. It is proposed to transfer £2,800 to the reserve fund as against £2,300, £7,500 to the disposition fund as in 1912, and £2,500 to the pension fund as in the previous year. The balance permits of the payment of a dividend of 6½ per cent. on the share capital of £625,000 as compared with the same rate on £500,000 in 1912, leaving £6,600 to be carried forward.

The Paris Metropolitan Railway.—The report of the Compagnie du Chemin de Fer Metropolitain de Paris, after giving details of the extension works undertaken by the City of Paris and the development works carried out by the company in 1913, states that the length of line worked for the company's account remained at 43.89 miles, whilst including the lines previously operated for the account of the city the total mileage at the end of the year was 48.29. The number of employees increased from 5,308 at the close of 1912 to 5,543 on December 31st, 1913, and the system of paying premiums for the purpose of inducing the men to take a greater interest in the working of the railway was considerably extended, the payments having amounted to £52,000, or £15,000 in excess of 1912. The total receipts amounted to £2,192,000 as contrasted with £2,216,000 in the previous year, and the expenses were £938,000 as against £942,000, the ratio of the latter to the former being 42.79 per cent. as compared with 42.52 per cent. in 1912. After deducting £701,000 as the share of the City of Paris in the gross receipts, as contrasted with £711,000, the accounts show working results of £553,000 as against £563,000 in the preceding year, and the net profits, after making loan charges, are £344,000 as compared with £348,000. The dividend amounts to 21½ francs per share (8.6 per cent.), being the same rate as in 1912, on share capital of £2,684,000. The average working results per kilometre of line in operation in 1913 declined by 1½ per cent.—or by £211 per mile as compared with the preceding year, this being due to two causes. In the first place the reduction was brought about for the greater part by the sacrifices made to enhance the welfare of the employees, and secondly to a considerably less extent by a slight fluctuation in the receipts. On the latter point the report states that the result need not cause surprise or still less any alarm. The transformation of the system of horse 'buses into motor 'buses two years ago produced analogous effects, which were foreseen and discounted, but the change had scarcely been completed when the Metropolitan Company's receipts rose again. It will certainly be the same in regard to the fresh decline, which is due to the electrification and extension of the tramway system. This work, which constitutes the second and final stage in connection with the great reorganisation of transport services on the surface which was definitely decided upon in 1910, could not fail to appeal to the railway traffic in its turn, and it might have been more prejudicial than the introduction of motor-omnibuses. But the shock has been borne once again without appreciable injury. Although the tramway reorganisation has not been quite finished the railway receipts are becoming what they were before, thus showing the vitality of the undertaking, and the opinion is expressed that the curve of the receipts will before long resume its upward course.

German—Netherlands Telegraph Co.—The report for 1913 of the Deutsch—Niederländische Telegraphen Gesellschaft, of Cologne, states that although the average increase in traffic which has hitherto been observed continued, the receipts de-

clined owing to the introduction of half rates for transmarine telegrams at the beginning of the year and the fall of 20 per cent. in the word rate for messages exchanged with the Far East in the second half of the year. It is, however, hoped to equalise the decrease by an expansion in traffic in future years. The Yap—Menado cable was interrupted in the vicinity of the latter place between February 23rd and March 11th in consequence of the cable wearing, through rubbing on the bed of the sea. Concerning the German South Sea Wireless Telegraph Co., in which the company and the Berlin Wireless Telegraph Co. are each interested to the extent of one-half of the capital, the report mentions that the first two large stations on Yap and Nauru were opened for traffic on December 1st, and the stations at Apia and Rabaul would probably be set in operation in the middle of the present year. The accounts indicate cable receipts amounting to £103,200 in 1913 as compared with £104,300 in the previous year; interest receipts were £5,300, and the balance brought forward is £12,200. After defraying general expenses and making provision for interest on loans, cable maintenance and depreciations funds, etc., there remains net profits of £40,000 as contrasted with £42,000 in 1912. It is intended to pay a dividend of 6½ per cent. on the share capital of £350,000, being the same rate as in the preceding year.

Hongkong Tramway Co., Ltd.

The directors' report for the year ended 31st December, 1913, states that after charging £10,355 for the year in respect of depreciation of track, rolling stock, cables, power plant, etc., the balance of profit brought down is £19,848, from which has to be deducted the debenture interest £9,340, showing a net profit for the year of £10,509 plus £7,127 brought forward, making an available balance of £17,636. Of this, the interim dividend for the six months ended 30th June, 1913, at the rate of 5 per cent. per annum, paid on the 29th October, 1913, free of income tax, absorbed £2,031. The directors recommend a final dividend for the six months ended 31st December, 1913, at the rate of 20 per cent. per annum, free of income tax, making 12½ per cent. for the year. This will require £8,125 and leave £7,480 to be carried forward. It is difficult to make accurate comparisons between the years 1912 and 1913, owing to the dislocation caused by the boycott during the end of the former year and the beginning of the latter year, but the position in Hongkong in this connection became normal some time since, and the traffic receipts for many months past have been very satisfactory. The Hongkong Government contributed $15,248 further as compensation towards the company's losses during the boycott, making a total contribution of $45,248. Unfortunately, however, there is still a considerable loss incurred on the Hongkong (British) subsidiary coinage, and it is difficult to foresee any amelioration in this respect in the near future. The Hongkong Government recently passed an Ordinance prohibiting the importation of foreign silver and nickel coinage. It came into operation on 1st March, 1914, and the directors hope that this will eventually have the effect of reducing the discount on the British subsidiary coinage, although they fear that the improvement will be slow. During the year the track from Praya East to the Racecourse has been extended to the Happy Valley and was opened for traffic in February, 1914. The length of the extension is about 600 yards. At the request of the Stockbrokers' Association of Hongkong arrangements are being made for the establishment of a Colonial Register in Hongkong under the control of a local committee in order to meet the convenience of shareholders resident in the colony of Hongkong. The directors again desire to place on record their appreciation of the services rendered by the manager, the agents, and the staff.

Canadian Westinghouse Co.—The report for the year ending December 31st, 1913, shows that the profits were $1 002,618, which sum was distributed as follows:—Dividends at 9 per cent., $445,026; bank interest, $28,700; reserve for insurance fund purposes, $50,000; written off property and plant, $250,000; carried forward to profit and loss account, $228,891. The total profit and loss account now stands at $1,531,491. The capital stock of the company is $5,000,000. There are no bonds.—*Canadian Electrical News.*

American Westinghouse Co.—According to the financial Press, the report of the Westinghouse Electric and Manufacturing Co. and subsidiaries for the year ended March 31st shows that the gross earnings amounted to $43,733,646, an increase of $3,756,081, and the net manufacturing profits were $4,717,222, an increase of $145,950. The total income was $5,998,078, an increase of $430,242, and the net income applicable to dividends and other purposes was $4,058,809, an increase of $894,777. The earnings on the common shares were equal to 10 73 per cent., as against 8·2 per cent. in 1913. Owing to the reaction in business this year the value of the unfilled orders shows a decrease of $4,110,088 to $7,951,385 at March 31st.

Ruston, Proctor & Co., Ltd.—For the year ended March, 1914, the profit was £119,118. The dividend on the ordinary shares is 8 per cent. for the year. £25,000 is put to reserve and equalisation of dividend account, and £16,821 is carried forward.

Japan.—The Anglo-Japanese Water Power Co., o Tokio, has decided to increase its capital by £180,000 to £300,000. The company's original plant at Ushikubi, on the River Oi, was planned to generate sufficient power to supply Hamamatsu and its vicinity. The increase in demand last year caused the company to build another power station on the River Tomoye, a tributary of the Yahagi. Since then the growth of demand has steadily continued, and now again the extension of the plant has become necessary. The construction of another power station on the River Tomoye is being planned, and it is for the purpose of raising the necessary funds that the enlargement of the capital is now proposed.

Stock Exchange Notices.—The Committee has appointed a special settling day as under:—

Friday, June 5th.—Victoria Falls and Transvaal Power Co., Ltd.—£650,000 5½ per cent. second mortgage debentures, Series B, Nos. 11,441 to 18,940 (£100 and £20).

And ordered the following to be quoted in the Official List:—

Calcutta Tramways Co., Ltd.—Further issue of 2,705 5 per cent. cumulative preference shares of £5 fully paid, Nos. 47,296 to 50,000.

Eastern Telegraph Co., Ltd.—Further issue of £103,294 4 per cent. mortgage debenture stock.

Application has been made for an official quotation in the following:—

Pennsylvania Water and Power Co.—$8,495,000 capital stock in shares of $100.

Continental.—Belgium.—La Société Be'ge pour la Fabrication des Cables et Fils Electriques, of Brussels, reports a profit for last year of £7,253.

The report of the Société des Accumulateurs Tudor, of Brussels, for the last financial year shows a profit of £9,996.

Russia.—The report of the Russian Tudor Accumulator Co., of St. Petersburg, for last year show a net profit of £42,238, as compared with only £36,529 in 1912. The dividend is being increased from 10 per cent. to 12 per cent.

British Electric Traction Co., Ltd.—Financial newspapers state that the directors have decided to place £50,000 to reserve (against £40,000 last year), and to recommend the payment of the dividend on the 6 per cent. cumulative preference stock, and a dividend at the rate of 3½ per cent. on the 7 per cent. non-cumulative preference stock, upon which 3 per cent. was paid last year.

Anderston Foundry Co., Ltd.—The directors recommend a final dividend of 15s. 6d. per share, making 20s. per share for the year. £10,000, which was withdrawn from the reserve fund four years ago, is to be restored.

Elmore's German and Austro-Hungarian Metal Co., Ltd.—According to the *Financial Times*, the accounts for 1913 show a profit, after charging debenture interest, of £30, reducing the debit balance brought forward to £16,348.

STOCKS AND SHARES.

Tuesday Evening.

Conditions in the Stock Exchange are a little puzzling. The financial atmosphere seems to be clearer, although, at the same time, every slight recovery in prices brings out fresh lots of stock. Recent bye-elections are considered to have brought within comparatively near range that appeal to the country, which the Stock Exchange as a whole hopes will prove in its result to be of benefit to the capitalist, large and small. Trouble threatens from Albania, but, on the other hand, the Austrian Emperor's health no longer gives cause for anxiety. Cross-currents are therefore conflicting, but Consols have hardened, and at the beginning of this week the Stock Exchange in general started off with confidence.

Home Railway stocks already show some degree of recovery from the weakness into which they were thrown on the modest proposals of Mr. J. H. Thomas, that all grades of railwaymen should receive an additional weekly wage of 5s. It is urged by the bullish party that, if a general increase of any substantial amount is granted, it can only be on the decision of the various railway companies to advance fares all round; and while this opinion received a somewhat chilly reception, it had at any rate the effect of making prices better. The Underground group is quiet, and the negotiations between the London General Omnibus Company and its men have been quoted as reasons why the stocks and shares in this group have hung back in the improvement shown by the steam stocks. Districts are flat, the price dropping 2½, on the apprehension of increased demands from the men.

The Underground Electric Railways Company of London, Ltd., has convened a meeting for June 15th, for the purpose of passing certain resolutions to turn the concern into a purely holding company in law, as well as in fact. According to the promoters of the scheme, this will enable distribution of dividends more quickly than might otherwise be the case; and it is explained that the proposals amount to little more than a legal formality, with this end in view. The idea was mooted at the last meeting held by the company, and promulgation of the details at the end of last week caused no change in the prices of the company's securities.

On balance the £10 shares are ⅛ harder, while the Income bonds eased off.

Disappointment is felt at the announcement that the British Electric Traction Company will pay 3½ per cent. on its 7 per cent. non-Cumulative Preference stock. This is ½ per cent. more than was distributed a year ago, but the market had looked for at least 5 per cent., and the Preference stock has fallen a point, the other stocks of the company also being unchanged. Other issues in this group are quietly steady, with business running on retail lines.

Brisbane Electric Tramways Ordinary shares have just been quoted *ex* the rights to the new shares; the price of these latter was temporarily fixed at 2 premium. Anglo-Argentine Tramways Preference shares improved a little, and the 4 per cent. Debenture stock rose with them; but Brazil Tractions have been flat, and upon resumption of selling which had the appearance of being forced, the price reacted to 77½, a drop of 3, with a point recovery later on. Calcutta Tramways Preference lost the small improvement registered a week ago. Rio Tramways bonds continued their advance.

The Mexican group is the turn harder, and that is all which can be said for it. It is something, however, for the securities to have retained their substantial improvements of last week, and these have been further added to by gains in the Light and Power Company's First Mortgage bonds and in Mexico Trams 6 per cent. bonds. Some of the recent Continental pressure to sell has been relaxed, and venturesome buyers are attracted by the big yields now to be obtained from a purchase of the bonds. So wide are the prices quoted in the shares that speculation in them is scarcely worth while, except to the man who, taking big risks, goes for big profits.

The Canadian division is a little unsteady, and a fall of 2 points took Canadian General Common shares to 105½. Canadian securities, as a whole, have received something of a fillip during the past few days by reason of reported discoveries of oil on a very extensive scale, which have served as an excuse for attracting fresh attention to the stocks and shares of the Dominion. In the Indian group, Calcutta Electric Supply Ordinary and Preference have both risen ½. Shanghai Electric Construction shares are wanted; the price is 5s. up at 13¾, and buyers demand the offer of further shares.

The only changes in the list of English electricity supply and power shares are another rise of ½ in St. James' and Pall Mall Ordinary, and a point decline in Urban First Debenture stock. Business in all the London issues is tamely quiet. There has been a little selling of County of London Ordinary by those who have elected to take up the new shares, a call on which fell due the other day. As has been pointed out here on previous occasions, there is a turn to be obtained by selling the old shares and taking up the new, since the latter can be bought at about 11⅜; the same conditions apply also to the Preference issue. The provincial shares hold all their lately-acquired strength. The course of investment markets, as a whole, has been against such a steady class as that of the Electricity Supply list. The yields on the shares, however, are sufficiently good to render it pretty certain that when business spreads, these shares will receive more attention than they are getting at the present time. A glance at the table overleaf shows that the returns derivable from good-class electric lighting shares are attractive enough, in view of the comparative cheapness of money.

West India and Panama Telegraphs have shed 5s., receding to 2 upon the appearance of the report, which was regarded as somewhat disappointing; possibly, however, the closing of a few speculative positions had as much to do with the decline as the issue of the accounts. Although there is a steady demand for other investment stocks in this division, no alterations have taken place in prices. Buyers find difficulty in obtaining delivery of stock and shares which they have purchased, and when they press for it, they are told that there is so little in the market that the sellers crave longer time than usual in which to satisfy their bargains. Under Stock Exchange rules, by the way, stocks and shares which remain undelivered ten days after the account day for which the bargain was done, can be "bought in" by the official broker in the House; and notwithstanding the fact that attempts to enforce delivery in this way are frequently unsuccessful, they are detested by people against whom the loss falls, inasmuch as they involve payment of heavy commission to the official broker. The client, of course, pays nothing at all.

Weakness continues to characterise the Marconi market. The parent shares have slipped back to 3⅛, so that if the dividend is maintained at its previous rate of 20 per cent., the return at the present time, allowing for the inclusion of dividend in the price, will work out to nearly 6¾ per cent. on the money. The Preference went back with the Common, and there were small falls in the shares of the subsidiary undertakings. Chile Telephones are a trifle harder, after their recent dullness; and New York Telephone bonds remain strong at a shade below 100.

In the Manufacturing list, Willans & Robinson Preference reacted to 42, on a little stock coming to market: British Westinghouse Preference remained in the ascendant, and this week there is a rise of 3s. 9d., which has carried up the price to 35s. The buying is persistent, and although there comes every now and then a bout of profit-taking, this does not seem to damp the spirits of the supporters of the market. Castner-Kellner's went back a trifle to 2⅝. The Cable shares are strong, Henleys and Callenders being what the Stock Exchange calls "good markets"; and the improvement in Electric Constructions of both classes is well maintained. Rubber issues have rallied a trifle after being dull and depressed. This week's auction sale in Mincing Lane realised fair prices, and the Stock Exchange settlement showed the presence of a good many bears in the share market.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, May 27th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a " Nitric	"	22/-	..
a " Oxalic	per lb.	2¾d.	..
a " Sulphuric	per cwt.	5/6	..
a Ammoniac Sal	"	42/-	..
a Ammonia, Muriate (large crystal)	per ton	£29	..
a Bleaching powder	"	£6 5	..
a Bisulphide of Carbon	"	£18	..
a Borax	"	£17 10	..
a Copper Sulphate	"	£21 5	..
a Lead, Nitrate	"	£30 10	..
a " White Sugar	"	£27 10	..
a " Peroxide	"	£32	..
c Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	8½d.	..
a Potash, Caustic (88/90 %) ..	per ton	£22 10	..
a " Chlorate	per lb.	8¾d.	..
a " Perchlorate	"	8½d.	..
a Potassium, Cyanide (98/100 %) .. (for mining purposes only)	"	1s.d.	..
a Shellac	per cwt.	70/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers ..	"	£8 10	..
a " Recovered	"	£5 10	..
a " Lump	"	£5 5	..
a Soda, Caustic (white 70/72 %) ..	"	£10	..
a " Chlorate	per lb.	3¾d.	..
a " Crystals	per ton	£2 5	..
a Sodium Bichromate, casks ..	per lb.	3d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots ..	per ton	£86	..
b " Wire, in ton lots (1 to 14 S.W.G.)	"	£107 6 8	..
b " Sheet, in ton lots ..	"	£112	..
g Babbitt's metal ingots	"	£50 to £221	..
c Brass (rolled metal 2° to 12° basis)	per lb.	7⅛d.	..
c " Tube (brazed)	"	9¾d.	..
c " " (solid drawn) ..	"	7⅛d.	..
c " Wire, basis	"	7⅛d.	⅛d. inc.
c Copper Tubes (brazed)	"	9¾d.	..
c " " (solid drawn) ..	"	9¾d.	..
g " Bars (best selected) ..	per ton	£78	..
g " Sheet	"	£78	..
g " Rod	"	£78	..
d " (Electrolytic) Bars ..	"	£66 5	..
d " " Sheets ..	"	£84 5	..
d " " Rods	"	£71 15	..
d " " H.C. Wire	per lb.	8¾d.	..
f Ebonite Rod	"	4/6	..
f " Sheet	"	4/-	..
n German Silver Wire	"	1/10	..
h Gutta-percha, fine	"	8/-	..
h India-rubber, Para fine	"	2/10	..
j Iron Pig (Cleveland warrants) ..	per ton	51/1	3¾d. dec.
l " Wire, galv. No. 8, P.O. qual.	"	£14	..
g Lead, English Pig	"	£19 5	10s. inc.
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bott.	£7	..
e Mica (in original cases) small ..	per lb.	6d. to 8s.	..
e " " " medium	"	8/6 to 6/-	..
e " " " large ..	"	7/6 to 11/-	..
o Nickel, sheet, wire, &c.	"	8/6 to 4/6 nom	..
p Phosphor Bronze, plain castings	"	1/1 to 1/3½	..
p " " rolled bars & rods	"	1/0½ to 1/3	..
p " " rolled strip & sheet	"	1/3½ to 1/5½	..
o Platinum	per oz.	185/-	..
d Silicium Bronze Wire	per lb.	10½d.	..
r Steel, Magnet, in bars	per ton	£55	..
g Tin, Block (English)	"	£150 10 to £151 10	£4 dec.
n " Wire, Nos. 1 to 16	per lb.	2/4	..
p White Anti-friction Metals ..	per ton	£44 to £194	..
k Zinc, Sh's (Vieille Montagne bnd.)	"	£25 2 6	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
j Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co

Mackay Companies.—In our issue of March 27th last, under the above heading, the annual report of the Mackay Companies of February 16th was dealt with, and we there drew attention to the meagreness of the particulars furnished to the shareholders. There has since been issued a postcard, containing on one side an advertisement of the Mackay Companies' systems, and on the other side a balance-sheet of the Commercial Cable Co. to December 31st, 1913, giving the value of cables, electric plant and equipment as $18,437,848; property purchased, $20,000,000; spare cable on hand, $242,072; New York State and City bonds, &c., less obligations connected therewith, $13,365,413; and sundry accounts, including traffic balances and cash in banks, $2,792,576. The liabilities are:—Capital stock, $25,000,000; first mortgage 4 per cent. gold bonds and debenture stock, $20,000,000; sundry accounts, including traffic balances, $1,779,460; and reserves, $8,058,449. This is, indeed, a very conservative statement, and it might well have been more ample.

SHARE LIST OF ELECTRICAL COMPANIES.

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1912.	Dividends for 1913.	Closing Quotations May 26th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bath Trams, Pref. Ord.	1	Nil	..	3/16 — 5/16	..	Nil
Do. 5 % Pref.	1	5	5	3/8 — 1/2	..	6 13 4
Do. 4½ % Deb.	100	4½	4½	70 — 75	..	6 0 0
Brit. Elec. Trac., 6 % Pref.	100	..	..	14½ — 16½	..	..
Do. Do. Deferred	100	..	..	5/16 — 7/16	..	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	89½ — 91½	..	6 11 2
Do. 7 % Non-Cum. Pr'f.	100	3	3½	54 — 57	—1	6 2 10
Do. 5 % Perp. Deb.	100	5	5	92½ — 94½	..	5 6 0
Do. 4½ % 2nd Deb.	100	4½	4½	77 — 80 xd	..	5 12 9
Central London Railway, Ord.	100	3	3	57 — 62	..	4 16 9
Do. Gtd. Assented	100	..	4	82 — 84	..	4 15 3
Do. Pref.	100	4	4	68 — 73	..	5 9 7
Do. Gtd. Assented	100	..	4	84 — 86	+1	4 13 0
Do. Def.	100	2	2	40 — 45	..	4 9 0
Do. Gtd. Assented	100	..	4	80 — 82	—1	4 17 7
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
City & S. London, 5 % Pref., 1891	100	5	5	95 — 97	..	5 3 1
Do. Do. 1896	100	5	5	91 — 94	..	5 6 5
Do. Do. 1901	100	5	5	89 — 92	..	5 8 8
Do. Do. 1903	100	5	5	89 — 92	..	5 8 8
Do. 4 % Deb.	100	4	4	86 — 88	..	4 11 0
Hastings Trams, 6 % Pref.	1	6	6†	13/16 — 15/16	..	8 6 8
Do. 4½ % Deb.	100	4½	4½	65 — 70	..	6 8 7
Isle of Thanet Trams, 5 % Pref.	5	2½	3	2 — 2½	..	6 0 0
Do. 4 % Deb.	100	4	4	73 — 78	..	5 2 7
Lancashire United, 5 % Deb.	100	5	5	87 — 89	..	5 12 4
London and Suburban, Ord.	1	..	..	3/16 — 5/16	..	..
Do. Do. 5 % Cum. Pref.	1	..	5†	11/16 — 13/16	..	7 12 8
Do. Do. 4½ % 1st Deb.	100	4½	4½	78 — 83	..	5 8 5
London Elec. Railways, 4 % Deb.	100	4	4	90 — 92	..	4 7 0
London United Trams, 4 % Deb.	100	4	4	56 — 60	..	6 13 4
Metropolitan Railway Consol.	100	1½	1½	39½ — 39¾	—½	4 1 9
Do. Surplus Lands	100	2½	2½	61 — 63	—1	4 7 4
Do. 5½ % Deb.	100	5½	5½	87 — 89	..	3 18 7
Do. 5½ % Pref.	100	5½	5½	82 — 84	..	4 3 4
Do. 5½ % Con. Pref.	100	5½	5½	80 — 82	..	4 5 4
Metropolitan District Ord.	100	Nil	..	23⅞ — 24¼	—2⅛	Nil
Do. 6 % Deb.	100	6	6	138 —141	..	4 5 3
Do. 4 % Deb.	100	4	4	93 — 95	+1	4 4 1
Do. 4 % Prior Lien	100	4	4	95 — 97	..	4 2 6
Do. 4½ % First Pref.	100	4½	4½	83 — 86	..	5 4 8
Do. 3½ % Gtd.	100	3½	3½	74 — 76	..	4 12 1
Metro. Elec. Trams, 4½ % Deb.	100	4½	4½	87 — 90	..	5 0 0
Do. 5 % Deb.	100	5	5	85½ — 88½	..	5 18 0
Potteries, Ord.	1	3½	3½	1/16 — 1/8	..	8 0 0
Do. 5 % Pref.	1	5	5	3/16 — 5/16	..	7 12 8
Do. 4½ % Deb.	100	4½	4½	81½ — 84½	..	5 6 2
South Metro. Trams, 4 % Deb.	100	4	4	66 — 70	..	5 14 4
Underground Elec. Railways	10	..	..	3 — 3⅛	+ ⅛	Nil
Do. "A"	1/-	..	..	3/32 — 3/32	..	Nil
Do. 6 % First Cum. Inc. Deb.	100	6	6	115 —117	..	5 2 7
Do. 4½ % Bonds	100	4½	4½	99⅜ —101½	..	4 8 8
Do. 6 % Income	100	6	6	88 — 89	— ½	6 14 10
Yorkshire (West Riding), Ord.	5	Nil	..	3/16 — 5/16	..	Nil
Do. 6 % Pref.	5	3	4	4⅜ — 4⅞	..	4 2 3
Do. 4½ % Deb.	100	4½	4½	84 — 87	..	5 3 6

ELECTRIC RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	4 11/16 — 4 13/16	+ 1/16	5 11 4
Do. 2nd Pref.	5	5½	5½	4 1/16 — 4 3/16	+ 1/16	6 2 8
Do. 4 % Deb.	100	4	4	92½ — 94½	+ ½	4 4 8
Do. 4½ % Deb.	100	4½	4½	98½ —101½	..	4 8 6
Do. 5 % Deb.	100	5	5	96½ — 98½	..	5 1 6
Auckland Trams, 5 % Deb.	100	5	5	103 —106	..	4 14 8
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅝ — 11⅜	..	5 4 4
Do. 4½ % Deb.	100	4½	4½	94⅛ — 96½	..	4 13 8
Do. 5 % 2nd Deb.	100	5	5	99 —101	..	4 19 0
Brazilian Traction, Light and Power	$100	6	6†	77 — 79	—2½	7 12 0
Brisbane Trams Invt., Ord.	5	8	8	7 — 7½ xd	..	5 0 0
Do. 5 % Pref.	5	5	5	4⅞ — 5⅛	..	4 13 0
Do. 4½ % Deb.	100	4½	4½	98 —101	..	4 9 1
B. Columbia Elec. Rly., Def.	100	8	8†	110 —114	—1	7 0 4
Do. Pref. Ord.	100	6	6	103 —107	—1	5 12 1
Do. 5 % Pref.	100	5	5	103 —106	+1	4 14 3
Do. 4½ % 1st Mort. Deb.	40	4½	4½	97 —100	+1	4 10 0
Do. 4½ % Vancouver Deb.	100	4½	4½	94 — 98	..	4 12 0
Do. 4½ % Con. Deb.	100	4½	4½	93⅛ — 95⅛	..	4 9 1
Calcutta Trams, Ord.	5	7½	9⅜	6⅛ — 7	..	6 15 9
Do. 5 % Pref.	5	5	5	5 — 5⅛	—1/16	4 15 3
Do. 4½ % Deb.	100	4½	4½	97 — 100	..	4 10 0
Cape Electric Trams	1	5	5	3/8 — 7/16	..	6 13 4
City Buenos Aires Trams (1904)	5	5	5	5 3/16 — 5 5/16	..	4 11 11
Do. 4 % Deb.	100	4	4	92 — 97	..	4 2 6
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	88 — 92	..	5 8 8
Havana Elec. Rly., 5 % Bonds	$1000	5	5	93½ — 97½	..	5 2 6
Kalgoorlie El. Trams 5% A Deb.	100	5	5	84 — 89	..	5 12 4
Do. 6% B Deb.	100	3	..	10 — 20	..	Nil
La Plata Elec. Trams, Ord.	1	..	..	1/16 — 3/16	..	..
Do. Pref.	1	4½d.	6	3/16 — 5/16	..	6 5 0
Lisbon Elec. Trams, Ord.	1	6	6	1 3/32 — 1 5/32	..	4 9 3
Do. 6 % Pref.	1	6	6	1 5/16 — 1 7/16	..	5 1 0
Do. 5 % Deb.	100	5	5	95 —100	..	5 0 0
Madras Elec. Tr., 6% Cum. Pref.	5	6	6	4⅞ — 5½	..	5 14 3
„ Elec. Tr. (1904), Deb.	100	5	5	101 —103	..	4 17 0
Manaos Trams & Lt., 1st Deb.	100	5	5	78 — 81	..	6 3 5
Manila Elec. R. and Ltg., Bonds	$1000	5	5	98½ —100½	..	4 19 6
Mexico Trams Com	$100	7	7	67 — 71	..	..
Do. Gen. Con. 5 % Bonds	..	5	5	77 — 81	..	6 3 5
Do. 6 % Bonds	100	6	6	75 — 80	+1	7 10 0
Para Elec. Rlys. & Lt., Ord.	5	10	10	3⅛ — 4⅜	..	11 8 6
Do. 6 % Pref.	5	6	6	4 — 4½	..	6 13 4
Do. 5 % 1st Deb.	100	5	5	86½ — 89½	..	5 11 8
Rangoon El. Tr. & Sup., Pref.	5	6	6	5 — 5½	..	5 9 1
Do. 4½ % 1st Deb.	100	4½	4½	95 — 97	..	4 12 9
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	96 — 98	+ ½	5 2 0
Do. 5 % Mort. Bonds	100	5	5	87½ — 89½	..	5 11 9
Sao Paulo Tram., Lt. and P. 5 % 1st Deb.	$500	5	5	96 —100	..	5 0 0
Singapore Trams, 5 % Deb.	100	5	5	88 — 92	..	5 8 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	95 — 97	..	5 3 0
Un. Elec. Trams Monte Video	5	7	7	4⅜ — 5⅛	..	6 16 7
Do. 6 % Pref.	5	6	6	4⅞ — 5⅛	..	5 14 3
Do. 5 % 1st Deb.	100	5	5	92½ — 95½	..	5 4 9
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	93½ — 95½	..	4 14 3

ELECTRICITY SUPPLY AND POWER COMPANIES.—HOME.

Bournemouth & Poole, Ord.	10	6	7	10 — 11	..	6 7 4
Do. 4½ % Pref.	10	4½	4½	9 — 10	..	4 10 0
Do. Second 6 % Pref.	10	6	6	10⅝ — 11⅝	..	5 10 4
Do. 4½ % Deb. Stock	Stock	4½	4½	95 — 98	..	4 11 9
Brompton & Kensington, Ord.	5	10	10	8⅞ — 9⅛	..	5 8 1
Do. 7 % Cum. Pref.	5	7	7	8⅛ — 8⅜	..	4 0 0
Central Electric Supply, 4 % Guar. Deb.	100	4	4	91½ — 94½	..	4 4 8
Charing Cross, West End & City	5	5	6	4⅞ — 5⅜	..	5 11 7
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 5	..	4 10 0
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	4½ — 4⅝	..	4 17 4
Do. Do. 4 % Deb.	100	4	4	92 — 94	..	4 5 1
Chelsea, Ord.	5	5	5	4⅝ — 5⅛	..	4 17 7
Do. 4½ % Deb.	Stock	4½	4½	97 —100	..	4 10 0
City of London, Ord.	10	9	10	16 — 17	..	5 17 8
Do. 6 % Cum. Pref.	10	6	6	12½ — 13½	..	4 9 0
Do. 5 % Deb.	Stock	5	5	116 —120	..	4 7 4
Do. 4½ % Second Deb.	100	4½	4½	100 —103	..	4 8 1
County of London, Ord.	10	6	7	11⅜ — 12½	..	5 14 3
Do. 6 % Pref.	10	6	6	11⅞ — 12⅞	..	4 17 0
Do. 4½ % Deb.	Stock	4½	4½	103 —106	..	4 5 3
Do. 4½ % Second Deb.	Stock	4½	4½	98 —101	..	4 9 1
Edmundson's, Ord.	£3	..	..	5/16 — 7/16	..	Nil
Do. 6 % Cum. Pref.	5	6	6	3⅜ — 4	..	7 10 0
Do. 6 % Non-Cum. Pref.	5	..	..	1⅝ — 2	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	84 — 87	..	5 3 6
Folkestone	5	6	6	5 — 5⅛	..	5 9 1
Do. 4½ % First Deb.	100	4½	4½	93 — 95	..	4 14 9
Hove	5	8	9	8⅛ — 9	..	5 0 0
Kensington & Knightsbridge, Ord.	5	8	9	7⅝ — 8	..	5 12 0
Do. 4 % Deb.	Stock	4	4	90 — 92	..	4 7 0
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	76 — 80	..	5 12 0
London Electric, Ord.	3	2½	3	1⅜ — 1½	..	5 2 7
Do. 6 % Pref.	5	6	6	4⅛ — 5½	..	5 14 3
Do. 4 % First Mort. Deb.	Stock	4	4	92½ — 93½	..	4 3 9
Metropolitan	5	4½	4½	3⅛ — 3½	..	6 0 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 5	..	4 10 0
Do. 4½ % First Mort. Deb.	Stock	4½	4½	97 —100	..	4 10 0
Do. 3½ % Mort Deb.	Stock	3½	3½	83 — 86	..	4 1 4
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	98 —101	..	4 19 1
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	9⅜ — 10⅛	..	5 14 3
Oxford	5	7	7	5 13/16 — 6 1/16	..	5 11 0
St. James' and Pall Mall, Ord.	5	10	12	9⅜ — 9⅝	+ ⅛	6 1 6
Do. 7 % Pref.	5	7	7	6⅞ — 7⅛	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	83 — 86	..	4 1 4
South London, Ord.	4	5½	5½	2⅜ — 3⅛	..	6 10 4
Do. 5 % First Mort. Deb.	100	5	5	99 — 102	..	4 18 0
South Metropolitan, 7 % Pref.	1	7	7	1 3/16 — 1 5/16	..	5 6 8
Do. 4½ % First Deb. Stock	100	4½	4½	97 — 100	..	4 10 0
Urban, Ord.	£3	Nil	..	5/16 — 3/8	..	..
Do. 5 % Cum Pref.	5	3†	4	2⅛ — 3	..	6 13 4
Do. 4½ % First Mort. Deb.	100	4½	4½	83 — 86	—1	5 4 8
Westminster, Ord.	5	10	10	8⅜ — 8⅝	..	5 14 3
Do. 4½ % Cum Pref.	5	4½	4½	4 13/16 — 5 1/16	..	4 6 9

* Unless otherwise stated, all shares are fully paid. † Interim Dividend. ‡ And Funded Certs.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—*(Continued.)*

ELECTRICITY SUPPLY AND POWER—COLONIAL AND FOREIGN.

NAME.	Stock or Share.	Dividends for		Closing Quotations May 26th.	Rise + or Fall —	Present Yield p.c.
Adelaide, 6 % Pref.	£5	6	6	5¼ — 5⅜	..	£ s. d. 5 11 7
Calcutta, Ord.	£5	8½	9	7⅞ — 8	+ ⅛	5 12 6
Do. 5 % Pref.	£5	5	5	5 1/16 — 5 5/16	+ 1/16	4 14 1
Calgary Power, 1st Mort. Bds.	100	5	5	90½ — 92½	..	5 8 0
Canadian Gen. El. Com.	$100	7	8	103 — 104	—2	7 5 6
Do. 7 % Pref.	$100	7	7	117 — 122	..	5 13 10
Cordoba Lt., Power and T., Ord.	1	5	..	7/16 — 1/2	..	7 12 0
Do. 5 % Deb.	100	5	5	87 — 90	..	5 11 1
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	83 — 88	..	6 16 4
Elec. Supply Victoria, 6 % 1st Mort. Deb.	100	5	5	91 — 94	..	5 6 5
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	93½ — 95½	..	5 4 9
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	3/16 — 3/32	..	Nil
Do. 6 % Pref.	£1	6	4	1/2 — 3/4	..	8 0 0
Kaministiquia Power, 5 % G. Bs.	$500	5	5	103 — 105	..	4 15 2
Madras, Ord.	£5	Nil	..	1½ — 1¾	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	105 — 108	+1	4 12 6
Mexican El. Lt., 5 % 1st M. Bds.	£	5	5	58 — 63	..	7 18 10
Mexican Lt. & Power, Common	$100	4	4†	38 — 41	+1	..
Do. 7 % Cum. Pref.	$100	7	7	68 — 73	..	9 11 5
Do. 5 % 1st Mort. Gold Bds.	..	5	5	70 — 75	+2	6 13 4
Do. 5 % 2nd Mort. Bonds	100	5	5	59 — 64	..	7 13 3
Monterey Ry., Light & Power, 5 % 1st Mort. Deb.	* 100	1912. 5	1913. 5	50 — 54	..	£ s. d. ..
Montreal, Lt., H. and Power	$100	9	10†	220 —225 xd	..	4 9 0
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5a	5a	10 — 20	..	..
River Plate, Ord.	Stock	10	10	235 — 245 xd	..	4 1 8
Do. 6 % Non-Cum. Pref.	Do.	6	6	97 — 103 xd	..	5 16 6
Do. 5 % Deb. Stock	Do.	5	5	101 — 103	..	4 17 0
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	100 —102	..	4 8 3
Shawinigan Water, Capital	$100	5½	6	134 —138	..	4 7 0
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107 —109	..	4 11 7
Do. 4½ % Per. Deb.	Stock	4½	4½	99½ — 101¼ xd	..	4 8 8
Toronto Power, 4½ % 1st Deb.	Do.	4½	4½	98 — 100 xd	..	4 10 0
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	85 — 89	—1	5 15 0
Victoria Falls Power, Pref.	1	6	6	33/32 — 35/32	..	7 13 4
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	103 —105	..	5 14 3

MANUFACTURING COMPANIES.

Aron, Ord.	£1	7	..	3/32 — 3/32	..	8 5 0
Do. 6 % Pref.	£1	6	6	1/4 — 1/4	..	6 17 2
Babcock & Wilcox	£1	16	16	2 15/16 — 3 1/16	..	5 4 7
Do. Pref.	£1	6	6	1 1/16 — 1 3/16	..	4 7 6
British Aluminium, Ord.	£1	..	5	1 1/16 — 1 1/8	..	4 14 1
Do. 6 % Cum. Pref.	£1	6	6	1 1/16 — 1 1/8	..	6 8 0
Do. 5 % Prior Liens Debs.	100	5	5	97 —100	..	5 0 0
Do. Deb. Stk.	100	5	5	90 — 95	..	5 5 3
B.I. & Heisby Cables	£5	10	13	9½ — 9⅝	..	6 13 4
Do. Pref.	£5	6	6	6¼ — 6⅜	..	4 14 1
Do. Deb.	100	4½	4½	101 —104	..	4 6 9
British Thomson-Houston, Deb.	100	4½	4½	92 — 94	..	4 15 9
British Westinghouse, Pref.	£2	Nil	5	1⅜ — 1 1/16	+ 1/16	5 10 6
Do. Deb.	100	4	4	73 — 75	..	5 6 8
Do. 6 % Prior Lien	100	6	6	100 —103	..	5 16 6
Browett, Lindley, Ord.	£1	..	..	2/- —3/-	..	Nil
Do. Pref.	£1	..	..	8/- —8/6	..	Nil
Brush, 7 % Pref.	£2	Nil	..	0 — ¼	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	80 — 85	..	5 17 8
Lo 4½ % Deb.	100	4½	4½	50 — 55	+1½	8 3 8
Do. 4½ % Second Deb.	100	4½	4½	29 — 33	..	13 12 8
Callender's Cable	£5	15	15	11⅞ — 12⅛	..	5 18 7
Do. Pref.	£5	5	5	5 — 5½	..	4 16 5
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Castner-Kellner	£1	20	22½	2⅛ — 2⅜	+ 1/16	8 3 9
Do. Deb.	100	4½	4½	104 —107	..	4 4 1
Crompton & Co., Deb.	100	5	5	83 — 85	..	5 17 8
Dick, Kerr	£1	Nil	..	3/4 — 7/8	..	..
Do. Pref.	£1	6	6	3 1/16 — 3 3/16	..	7 13 4
Edison & Swan, A, £2 paid	£5	Nil	..	0 — 1/8	..	Nil
Do. fully paid	£5	Nil	..	1 — 1½	..	Nil
Do. 4 % Deb.	100	4	4	58 — 62	..	6 9 1
Do. 5 % Second Deb.	100	5	5	61 — 66	..	7 11 6
Electric Construction	£1	5	6	2/3 — 3/4	..	8 0 0
Do. Pref.	£1	7	7	1 — 1⅛	..	6 4 5
Greenwood & Batley, Pref.	£10	7	7	6¾ — 7¼	..	9 13 2
Do. Deb.	100	5	5	92 — 94	..	5 8 5
General Electric, 6 % Pref.	£10	6	6	10½ — 10⅝	..	5 14 3
Do. Deb.	100	4	4	87 — 91	..	4 8 0
Henley's, Ord.	£5	15	20	14½ — 15½	..	6 9 0
Do. Pref.	£5	4½	4½	4⅝ — 5¼	..	4 7 10
Do. Deb.	100	4½	4½	101½ —103½	..	4 7 0
India-Rubber, G. & T.	£10	7½	7½	10 — 11	..	6 16 5
Do. Pref.	£10	5	5	8¾ — 9½	..	5 5 3
Telegraph Construction	£12	20	20	86½ — 88½	..	6 4 7
Do. Deb.	100	4	4	98 —100	..	4 0 0
Willans & Robinson, 4 % 1st Mort. Deb.	100	4	..	64 — 68	..	5 17 8
Do. B 4 % Cum. Pref.	100	..	£4	40 — 44 xd	—2	9 1 10

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	£10	4½	4½	5⅜ — 6⅝	..	7 4 0
Do. 5 % Deb. Red.	Stock	5	5	94 — 97	..	5 3 0
American Telep. & Teleg., Cap.	$100	8	8	123 —127	..	6 6 0
Do. Collat. Trust	$1000	4	4	91 — 94	+1	4 5 0
Anglo-American Telegraph	Stock	3	3	64 — 67	..	4 9 7
Do. 6 % Pref.	Do.	6	6	108½ —109½	..	5 10 1
Do. Def.	Do.	30/-	30/-	23⅜ — 23⅝	..	6 7 0
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	£5	8	6†	7⅛ — 7⅜	+ 1/16	5 6 8
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	79 — 81	+1	4 18 9
Cuba Telegraph	£10	6	6†	8½ — 9½ xd	..	6 6 4
Do. 10 % Pref.	£10	10	10	16 — 17 xd	..	5 17 8
Direct Spanish Telegraph, Ord.	£5	4	4	3¾ — 4	..	5 0 0
Do. 10 % Cum. Pref.	£5	10	10	7½ — 7⅞	..	6 9 0
Direct United States Cable	£10	4	4	6½ — 7	..	5 14 4
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7	180 —183 xd	..	5 5 3
Do. 3½ % Pref. Stock	Do.	3½	3½	77 — 79 xd	..	4 8 9
Do. 4 % Mort. Deb.	Do.	4	4	94 — 96	..	4 3 4
Eastern Extension	£10	7	7	12½ — 13 xd	..	5 7 9
Do. 4 % Deb.	Stock	4	4	94½ — 96½	..	4 3 0
Globe Telegraph and Trust	£10	6	6†	10⅝ — 11⅝	..	5 5 4
Do. 6 % Pref.	£10	6	6	12½ — 13	..	4 12 4
Great Northern Telegraph	£10	20	20	31 — 33	..	6 1 1
Indo-European Telegraph	£25	13	13	56½ — 58½	..	5 11 1
Mackay Companies Common	$100	5	5	81 — 84	..	5 19 1
Do. 4 % Cum. Pref.	$100	4	4	68 — 71	..	5 12 7
Marconi's Wireless Telegraph	£1	20	20	3 — 3⅛	—1/16	6 7 10
Do. 7 % Cum. Partic. Pref.	£1	17	..	2⅞ — 2⅞	—1/16	6 9 6
Monte Video Telephone, Ord.	£1	6	6	1/16 — 1/8	..	6 8 0
Do. 5 % Pref.	£1	5	5	3/32 — 5/32	..	5 18 6
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	99 — 100	..	4 10 0
Oriental Telep. and Elec.	£1	10	10	2 1/16 — 2 5/16	..	4 6 7
Do. 6 % Cum. Pref.	£1	6	6	1 5/16 — 1 3/8	..	4 13 5
Do. 4 % Red. Deb.	Stock	4	4	87½ — 89½	..	4 9 5
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	98 —100	..	4 0 0
Reuter's	£10	10	7	8¾ — 9½	..	7 7 4
Submarine Cables Trust	Cert.	6	6	126 —129	..	4 13 0
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	98 —100	..	4 10 0
United River Plate Telephone	£5	8	6†	6½ — 6⅞ xd	..	5 18 5
Do. 5 % Cum. Pref.	£5	5	5	5¼ — 6⅛	..	4 9 0
West Coast of America	2½	2½	N	3/8 — 1½	..	Nil
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	96 — 99	..	4 0 10
West India and Panama Teleg.	£10	1½	1½	1⅞ — 2⅛	—1/16	5 17 8
Do. 6 % Cum. 1st Pref.	£10	6	6	9⅜ — 10⅛	..	5 18 5
Do. 6 % Cum. 2nd Pref	£10	6	6	8⅜ — 9⅜	..	6 11 6
Do. 5 % Debs.	£100	5	5	97 — 99	..	5 1 0
Western Telegraph, Ltd.	£10	7	7	13⅜ — 13⅞	..	5 1 11
Do. 4 % Debs.	Stock	4	4	95½ — 97½	..	4 2 1
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	94 — 97	..	4 12 9

* Unless otherwise stated all shares are fully paid. † Interim dividend. a Paid in deferred interest warrants.

Bank rate of Discount 3 per cent., January 29th, 1914.

Electrical Exhibition in Turkey.—An interesting Electrical Exhibition—the first of the kind in the country—organised by the Société Ottomane d'Electricité, was opened in Constantinople on the 16th inst., and is attracting considerable attention. The display comprises all applications of electricity, from electric irons, cooking stoves and other household uses, to the more industrial departments of central station, electric tramway, telegraph and telephone equipment. Among the many exhibits that may be mentioned are those of the A.E.G., of Berlin, Messrs. L. Faure & Co., a French electrical engineering concern, Messrs. Ganz and Co., of Budapest, Messrs. Kirchner & Co. (electrically-operated wood-working machinery), the Siemens-Schuckertwerke Gesellschaft, of Berlin, and the varied display of the British Agencies Association. The last-named body, of which Mr. Robert Rowell is the managing director, is representing the interests in Turkey of a number of well-known British firms, amongst which may be mentioned Callender's Cable and Construction Co., Ltd., Messrs. Thos. Firth & Sons, Ltd., the Birmingham Small Arms Co., Ltd., Messrs. R. & W. Hawthorn, Leslie & Co., Ltd., Messrs. Dick, Kerr & Co., Ltd., the Birmingham Metal & Munitions Co., Ltd., the Cotton Powder Co., Ltd., the Weldless Steel Tube Co., Ltd., Messrs. John Musgrave & Co., Ltd., and Sir Wm. Arrol & Co., Ltd. As will be gathered, the display of the Association is an extremely varied one, and it is interesting and satisfactory to learn that, after leaving the Turkish market so long to German and Continental manufacturers, the organised efforts towards bringing British productions to the front are beginning to make themselves felt.

REVIEWS.

Transmission Line Formulas for Electrical Engineers and Engineering Students. By H. B. Dwight. London: Constable & Co., Ltd. Price 8s. 6d. net.

The title of this little book indicates with sufficient clearness its country of origin, and we are not therefore unprepared to find that the sizes of conductors are given in B. & S. gauge, and that the standard frequencies for which the tables are prepared are 25 and 60 cycles per sec. These circumstances may to some extent impair its usefulness to the British reader; but there is much material in the book which will make it helpful to the electrical engineer in this country who has occasion to make frequent estimates and calculations for long-distance alternating current transmissions.

For reasons which are given later, we do not feel able to recommend the engineering student to make use of Mr. Dwight's work, unless his previous experience in line calculations has been extensive.

The author states that the object of his book is to present a set of instructions for engineers which will enable them to make the electrical calculations for transmission lines with the least possible amount of work. He has, accordingly, prepared charts, formulæ (or ought we to say formulas?) and tables for facilitating the determination of the regulation, current, voltage, efficiency, etc. of both long and short lines for single, two and three-phase currents, with notes appended as to their limits of accuracy and application, and the methods of employing the tables, together with actual examples worked by way of illustration. This occupies the first half of the book, which is headed "Working Formulas."

The second portion is entitled "Theory," and contains the derivation of various standard expressions for the reactance of lines, their resistance due to skin effect, the capacity of lines with various arrangements of conductors, etc., carried out mathematically more according to the plan of an ordinary text-book.

Part III contains a collection of the tables used in the first part arranged for handy reference, and a number of numerical tables of constants of standard sizes of conductors with various spacings, so that the reactance, resistance, capacity, etc. can be found by inspection.

We ought to state that the book deals exclusively with overhead lines for alternating current transmission.

As a convenient book of reference in connection with calculations in this branch of electrical engineering, it should be found very useful and practical. When once the system of working employed by the author and the significance of the formulæ and data which are given have been thoroughly mastered, we can imagine that the work may become a faithful and helpful friend to anyone who has frequent calculations to make in connection with transmission schemes.

As a guide to the non-expert or to the student of limited experience, on the other hand, we fear that a word of warning must be given. Many of the approximations and the mathematical statements, while legitimate in the sense that they do not lead the author into numerical inexactitude, because he understands exactly what he is about, are likely to produce confusion of ideas in the mind of a younger colleague, and may lead him into serious blunders and practical errors.

So long as the unskilled pupil is content to accept the author's instructions to do this or that, and so long as the problem to be solved comes within the category of those for which full instructions are given—so long may he safely manipulate the machine which the book sets before him, and so long will he get a correct answer. When, however, because of native inquisitiveness or from the exigences of a fresh problem the unwary pupil glances aside from the rigid instructions and begins to use his own brains, we fear he will rapidly become involved in difficulties from which he will only be extricated after appeals to other sources.

We may indicate some of the points which appear to us likely to confuse the unskilled reader.

In the case of three-phase transmission lines, the current is calculated as having a value $P = VAE$ (in total amps.), where P is the total power in the three-phase circuit, VA is the total volt-amps., and E is the voltage between the lines.

The use of the term "total amperes" in this sense is highly unscientific and most confusing to the student, whether we agree that it is justifiable in practical calculations or not.

It is often not necessary to distinguish between vectorial and arithmetical addition or subtraction of voltages and currents in obtaining the author's formulæ within the degree of accuracy aimed at. The complete omission in many parts of the book to make any distinction between these forms of addition or subtraction might, however, lead the student far astray, if he failed to recognise this distinction between them in other cases. The use of the symbolic notation for currents and voltages appears to the author to need little explanation, but we think that his somewhat loose and confusing use of it would prove a snare to anyone not already familiar with it. The author makes no clear distinction between quantities expressed vectorially and numerically, and for some unknown reason writes the expression for impedance $Z = R + JX$, and for admittance $Y = G + JB$. The first of these is correct, but the second expression ought to have a negative sign. This change of the sign does not appear to be a misprint since it recurs several times in different parts of the book.

It is a pity that the chart which forms the frontispiece should have been gummed in in such a way that the crease which occurs at the centre makes it practically impossible to use a ruler for getting values in the manner intended.

In conclusion, we may repeat that for the experienced worker there is much valuable material in the book, and we welcome it as a useful piece of work, which must have involved considerable labour in its preparation, and which may save much labour of a similar nature on the part of those who make use of it.

Electrical Engineering. The Theory and Characteristics of Electrical Circuits and Machinery. By Clarence V. Christie, M.A., B.Sc. London: Hill Publishing Co., Ltd. Price 17s. net.

This is a good example of a carefully compiled and clearly written college text-book. Beginning with the development of the mathematical principles of electrostatics (electricity at rest) and of electromagnetics (electricity in motion), the author leads on to the theory of electrical circuits, direct-current machines, synchronous machinery, transformers, induction motors, alternating-current commutator motors, converters and transmission lines.

The treatment throughout is intentionally academic and theoretical, but the author uses excellent judgment in keeping it simple and in avoiding such matters as would require a very advanced mathematical treatment, while he introduces nothing which has a purely theoretical interest. The mathematical knowledge expected does not exceed that of a capable college student in his second or third year, who is familiar with the ordinary forms of differentiation and integration.

It is difficult to give in detail the amount of ground covered by the book, but it may be said to contain the theoretical basis of the subjects which have been enumerated above so far as they may

be expected to occur in an ordinary college course. There is little descriptive matter, and questions of design do not come within the author's plan.

Where so large a field is touched upon, it is only to be expected that some portion of the theory of electrical engineering should be only briefly dealt with. We find that although the theory of commutation is discussed in some detail, the subject of interpoles is rather scantily treated. The theory of the A.C. commutator motor is also less fully given than might have been expected in view of its increasing importance.

The synchronous reactance of an alternator is obtained as the quotient of the open-circuit voltage by the short-circuit current. A little fuller explanation of the assumptions underlying this method of derivation and of the errors to which it is subject would have been advisable.

We imagine that the author would not lay claim to originality in his treatment, but we can congratulate him on having produced an excellent text-book to serve the purpose mentioned in his preface, viz.: that of a foundation for lecture courses for junior and senior students in Electrical Engineering.

The book is excellently printed, and the diagrams are clear and well reproduced.

Photo-Electricity. By H. Stanley Allen, M.A., D.Sc. London: Longmans, Green and Co. Price 7/6 net.

The study of electrical effects due to the influence of light may be said to have begun with the observation of Hertz in 1887, that the incidence of ultra-violet light facilitated the passage of the electric spark. Up to the appearance of the present volume the only connected account of these effects was to be found in Sir J. J. Thomson's book *The Conduction of Electricity through Gases*, Second Edition, 1906.

Dr. Allen has, in the book under review, given a very full account of all the photo-electric work which culminated in Professor Thomson's identification and measurement of the electron, the "atom" or natural unit of negative electricity, in 1899; and he has also incorporated the results of a large amount of research carried out since Professor Thomson's account was published. The fact that Mr. Allen has contributed considerably to the present knowledge of photo-electric phenomena by his own researches, and has also had the advice and assistance of Dr. Ladenburg, the eminent German worker in these subjects, in the preparation of his monograph, lends to it a special weight of interest and authority.

The early experiments of Hertz and Hallwachs are illustrated and described in the introductory chapters, followed by the historic researches of Sir J. J. Thomson in 1897 and onwards, on the emission of negative electrons or corpuscles in a vacuum. The classical experiments for the determination of the elementary charge e, the ratio e/m, and the electronic velocity are all described in detail.

The author then passes on to consider the photo-electric current in gases at various pressures. Whereas the current or stream of electrons liberated by ultra-violet light in a vacuum is identical with the kathode rays in the Crookes tube, except that the electronic velocities are less, the current in a gas is partly due to the comparatively slow motion of negatively charged ions, *i.e.*, electrons attached to molecules of the gas. Rutherford's experiment on the velocities of these ions in different gases is referred to. The extent to which ions or electrons predominate in producing the photo-electric current depends upon the pressure and the strength of the electric field, and the exact nature of this dependence has been the subject of extensive experimental and theoretical investigations which are all fully explained in Chapter V.

The photo-electric activities of various substances —metals, liquids, and gases—are dealt with, and also the attempts to classify substances by various experimenters, including Ramsay and Herman, according to their photo-electric activity or their capability of emitting electrons under the influence of light.

The fact that marked differences have been observed by Marconi in the transmission of electro-magnetic waves by day and by night shows that the photo-electric properties of gases are of something more than theoretical interest. The study of the action of light on gases is, however, an extremely difficult one, and elaborate investigations carried out by Lenard at Heidelberg show that the presence of even minute traces of impurities produces exceptionally complicated effects. The action of ultra-violet light on a gas may produce one or more of three different actions, viz.: (1) chemical action, *e.g.*, the formation of ozone in oxygen; (2) the formation of condensation nuclei; (3) the formation of molecular electrical carriers; and since solar rays include the ultra-violet, the above actions may all be expected to occur in the atmosphere and are likely to raise important meteorological and "wireless" questions.

Important chapters are also included on the influence of the character of the light on photo-electric effects and on photo-electric fatigue—the latter being largely on account of the author's original researches.

Two delightful essays on "Fluorescence and Phosphorescence" and "Photo-chemical Actions and Photography"—both treated in the light of the most modern theories and investigations—complete a work which is unique both in subject matter and in thoroughness of treatment.—P.H.S.K.

Rays of Positive Electricity and their Application to Chemical Analysis. By Sir J. J. Thomson. London: Longmans, Green and Co. Price 5/- net.

The author gives in his book an account of experiments carried out during the last seven years in the Cavendish Laboratory on the nature of the positive rays. These have been previously known as Canal Rays, and were so designated by Goldstein, who discovered them in 1886. He found that if in a vacuum tube containing gas at low pressure a metal cathode was fixed through which a number of holes were drilled—the axes of the holes being at right angles to the surface of the plate—and if the terminals of an induction coil were connected to the anode and cathode and a discharge allowed to pass, slightly diverging bundles of luminosity streamed through the holes. The colour of this depended upon the nature of the gas with which the tube was filled. These rays have since been proved to consist chiefly of positively charged particles, hence Sir J. J. Thomson now calls them positive rays. When they strike against the glass sides of the tube they cause phosphorescence in the glass. This is different to that produced by the cathode rays, being much less bright. With some substances the contrast is very striking. With fused lithium chloride for instance, the phosphorescence produced by the positive rays is intense red, and that due to the cathode rays is light blue. As this power to cause phosphorescence is valuable in testing the deflection of the positive rays, produced by electric and magnetic forces, it was important to discover the substance which phosphoresced to the greatest extent. This was found to be willemite, a natural silicate of zinc.

The author gives an account of Goldstein's experiments, and then goes on to a description of Wien's proof that the rays are capable of electric and magnetic deflection. Unlike the cathode rays, it was for long thought that the positive rays were indifferent to electric and magnetic fields, but in

1898 Wien showed, by the use of very powerful magnetic forces, that the rays *can* be deflected, although the amount is only some 2 per cent. of that for the cathode rays under similar conditions.

The author proceeds to describe the first experiments he carried out. In these he subjected the rays to powerful electrostatic and magnetic fields acting at right angles to each other. With very low pressures of gas in the vacuum tube he found that he obtained on the willemite screen a series of parabolic curves. Now the positions of these parabolas depend, if other things are kept constant, on the masses of the positive particles; hence by means of the curves much information on the nature of the particles can be obtained.

Some apparatus of an exceedingly ingenious nature is described in connection with the experiments, and photographic illustrations of the curves are given.

The author discusses in some detail the question of atoms carrying two or more positive charges. It seems that a mercury atom can carry no fewer than 8 charges, and other substances a less number. The maximum number of charges carried by a charged atom does not seem to be related to any chemical property of the atom, such as its valency, but to depend mainly on the atomic weight. The multiple charge has been found on the atoms of all the elements tested with the single exception of hydrogen—no hydrogen atom with more than one charge has ever been observed.

The information afforded by the positive rays is of great use in the investigation of the constitution of gases and the properties of atoms and molecules. The rays indicate, among other things, the following:—(1) In some gases we have both atoms and molecules, in others only atoms; (2) the atoms and molecules of the gas can be charged with electricity, all of them with positive electricity, and some of the atoms with negative as well; (3) multiple charges on atoms except hydrogen; (4) no case of a double charge on a molecule; (5) in addition to the atoms and molecules of recognised elements, the existence of radicles and other combinations not known to exist permanently in the free state, for instance: the systems CH_1, CH_2, CH_3, are detectable as well as CH_4.

The work is a masterpiece of experiment and deduction.—W.J.C.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Prometheus Irons.

The British Prometheus Co., Ltd., of Salop Street Works, Birmingham, have just brought out a series of electric flat-irons for domestic and industrial uses, guaranteed for three years. These irons are very heavily nickel-plated and highly polished, and the

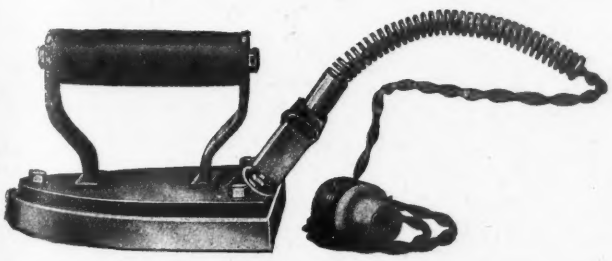


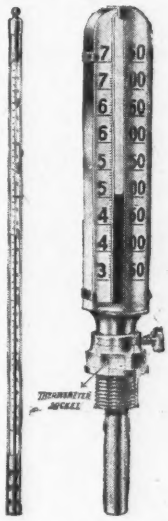
Fig. 1.—Prometheus General Domestic Iron.

elements employed are of the latest Prometheus pattern. The iron illustrated weighs 5 lb., and is provided with two-pin terminals, marble connector, and spiral cable protector.

The "industrial" irons are of similar design but usually heavier—up to 24 lb.—and include irons for special purposes; and a special "colonial" series at a lower price is also made. The heating elements can be exchanged in a few minutes by unskilled persons.

Magnifying Thermometers.

We have received from Messrs. T. Sugden, Ltd., of 180, Fleet Street, E.C., particulars of their new magnifying thermometers which they are placing on the market, to get over the difficulty, in the case of ordinary thermometers when placed in inaccessible positions, of reading the scale.



Ordinary Pattern Thermometer. Sugden's Magnifying Thermometer.

Fig. 2.

The magnifying thermometers are stated to be less fragile and more accurate than the ordinary types, and are made with scales up to 1,000° F., to suit almost any purpose.

A.C. Buzzer.

The London and Rugby Engineering Co., Ltd., of 10, Bush Lane, Cannon Street, E.C., have recently introduced an A.C. buzzer, shown in fig. 3, which has been designed to replace both bell and battery where A.C. supply is available, and it is intended to supersede the bell transformer and separate bell hitherto used. The primary winding is suitable for voltages of 100-130, 200-260; standard makes are suitable for 50 cycles and upwards. The device contains no working parts to get out of order.

A.C. Buzzer for Bell Circuits.

Fig. 3.

Electric Clocks on the "Aquitania."

We understand that the "Pulsynetic" system of electric impulse clocks has been fitted throughout the *Aquitania*, Britain's largest liner, the manufacturers being Messrs. Gent & Co., Ltd., of Leicester. The order was placed through Messrs. Edward and Sons, Glasgow, who are the Scottish agents for the firm, the installation being carried out under their supervision by Messrs. W. C. Martin & Co.

A very large number of dials are fitted, and they are all of special design and finish, there being hardly two alike throughout the whole vessel. Several of them are old masterpieces which have

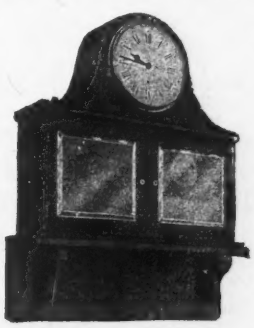


Fig. 4.—Pulsynetic Marine Transmitter.

been fitted with "Pulsynetic" movements, the original dials and hands being retained. Special interest centres in the master clock, or impulse transmitter in the chart room, which is fitted with a chronometer balance, a pendulum being, of course, impossible for use on board ship. A novel and ingenious automatic advancing and retarding mechanism, fitted to the master clock, enables all the dials to be simultaneously corrected to ship's time daily. We understand that the principle of automatically advancing is an

entirely new contrivance, and supersedes the existing cruder methods of advancing the ship's clocks when sailing eastwards. Particulars are given in Messrs. Gent's Book 19, on "Pulsynetic electric clocks adapted for ship use."

Submarine Motor Ship Cleaner.

We briefly referred, on page 767, to the new apparatus for cleaning ships' hulls, which has been introduced into this country by the Submarine Motor Ship Cleaner Co., of 66, Broad Street Avenue, E.C. Through the courtesy of this firm we are now able to illustrate the principal features of this plant, which, as previously mentioned, consists of a barge equipped with a 28-h.p. four-cylinder petrol-electric set supplying energy for operating the propelling motor, a winch and the cleaning gear suspended from it. The main generator is a 10-kw. 230-volt machine, provided with suitable switchgear; the propeller motor, rated at 10 b.h.p., drives a three-bladed propeller, the petrol consumption for driving the barge being one gallon an hour.

A special four-drum winch is fitted in connection with the submersible cleaning gear, two drums being for carrying the latter suspended by ropes over the side, while one contains the cable supplying the motor for operating it; all these drums are gear-driven from a 3½-h.p. motor, the fourth drum for working the jib

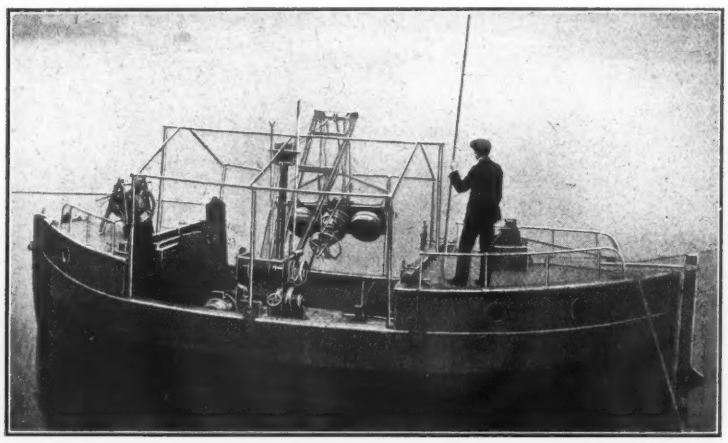


Fig. 5.—Barge Fitted with Winch, and showing Ship Cleaner Slung Overboard.

being hand-operated. The submersible gear consists essentially of a revolving brush, 5 ft. long and 12 in. in diameter, which is held up to the plating of the ship by the thrust of a propeller running behind it.

A 10-h.p. motor, running at 2,500 to 2,800 r.p.m., supplies the motive power, being connected by worm and chain gearing to the brush, and by concentric reducing gear to the propeller.

The revolving brush is lowered by the winch to the required depth, and raised to the surface cleaning a strip of plating, the barge then moving forward into position for cleaning the next strip. An average speed of lowering the brush is 45 ft. per min., the brush running at about 160 r.p.m. The plant is operated by an engineer and three assistants.

At a recent demonstration with the cable ship *Faraday*, it was estimated from work actually accomplished that the whole ship, of 5,000 gross tonnage and 360 ft. on the water-line, would be cleaned in about 5½ hours.

B.T.H. Alabaster Bowls.

The British Thomson-Houston Co., Ltd., 77, Upper Thames Street, E.C., have recently introduced several patterns of translucent dishes for semi-indirect lighting, cut from solid blocks of alabaster. They can be had in various tints, white, red or

Fig. 7.—B.T.H. Alabaster Dish.

yellow and produce a soft and mellow illumination. We illustrate one of the dishes, and particulars of others can be obtained from the company.

Domestic Electric Refrigerators.

We have received from the A.E.G. Electric Co., Ltd., of 133, Oxford Street, W., particulars of a small electrically-operated refrigerating plant which they have placed on the market.

This consists of a cold storage chest and ice chamber in the form of a cabinet, with a smaller cabinet mounted above it containing a ¼-h.p. motor, either A.C. or D.C., direct-coupled to a small compressor. The apparatus consists of a copper refrigerator coil in which the evaporation of the cooling liquid—in this case ethyl chloride—takes place; the lower part cools the chest while the upper part contains a brine bath for ice making.

The compressor, previously mentioned, sucks the vapour from the coil, and compresses it, after which it is cooled in a condenser placed in the base of the machine (and requiring about nine gallons of cooling water an hour), and returns to the refrigerating coil through a reducing valve, producing a sudden pressure drop.

The chest is well insulated, and the refrigerator has a capacity of 880-1,000 B.Th.U.; it will cool the air in the chest (127 cb. ft.) to about 24° F., and make about 2·2 lb. of ice per hour.

Some G.E.C. Accessories.

The General Electric Co., Ltd., of 67, Queen Victoria Street, E.C., have recently introduced the new pattern suspension switch shown in figs. 8 and 9. The new switch is of neat design, being only 2¼ in. long and ¾ in. in diameter, and has the terminals arranged at each end. The cord grip is efficient, and the body is composed of non-inflammable imitation ivory, as a standard. By short-circuiting the lower terminals with a piece of copper wire, the switch can be used (as shown in fig. 9) as an ordinary suspension switch.

The company has extended its range of "Slick" tumbler switches by the inclusion of a combined switch and wall plug. Another

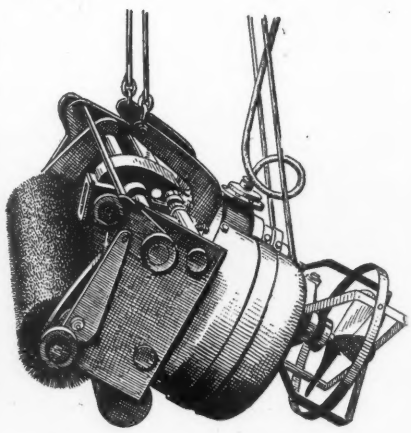


Fig. 6.—Submersible Cleaning Gear.

"Slick" switch has been added for use with flush switch plates for two-way working. Fig. 10 represents a special type of bayonet lampholder for use with signs, radiators, &c., in which the back of the lampholder is quite open and the fixing of the holder very simple. A substantial backplate lampholder known as the

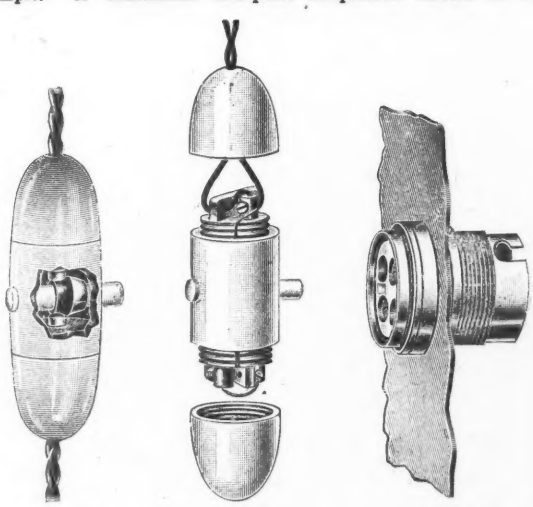


Fig. 8. Fig 9. Fig. 10

Fig. 8.—G.E.C. Suspension Switch, showing Operating Mechanism.

Fig. 9.—G.E.C. Suspension Switch, showing Lower Terminals Short-circuited, for use as a Plain Suspension Switch.

Fig. 10.—G.E.C. Bayonet Lamp-holder, for use in Signs, Radiators, &c.

Excel" has also been introduced, having a deep recess at the back for the wires.

Where insulated lampholders are required, the company is now offering an outer case of high-grade fireproof insulating material instead of china. In connection with its traction supplies, the G.E. Co. has added the "Acme" splicing sleeve for splicing trolley wires.

Reyrolle Lighting Panel.

A new arrangement of panel specially constructed for use in power and sub-stations on South American railways, by Messrs. A. Reyrolle & Co., Ltd., of Hebburn, is shown in fig. 11.

The marble front is mounted on a box-shaped frame carried on a pair of wall brackets. A change-over switch operated from the handle shown on the bottom of the marble panel, enables the lighting supply to be taken from one or other of the two sources.

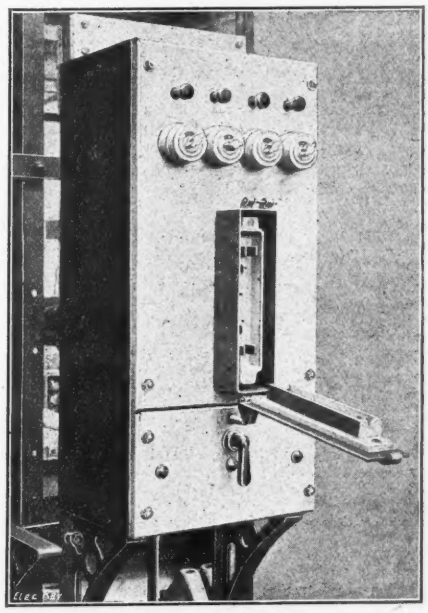


Fig. 11.—Reyrolle Railway Lighting Panel.

The lid of the main fuse is so interlocked with this change-over switch that access to the terminals can only be obtained when the switch is in the "Off" position as shown in the view.

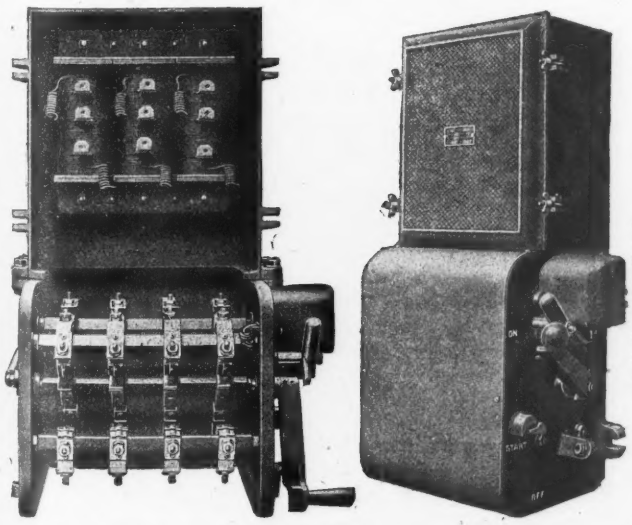
There are four lighting circuits leading away from the top of the panel through quick-acting rotary switches in porcelain covers, and fuses. The latter are of a cartridge type, provided with handles for the purpose of easy removal.

The arrangement is for taking a direct-current 800-volt lighting supply from the track circuits, one pole being earthed.

E.A.C. Starters.

We have received from the Electrical Apparatus Co., Ltd., of Vauxhall Works, South Lambeth Road, S.W., particulars of their redesigned star-delta and auto-starters, which are dealt with in lists H 43/1 and H 42/1 respectively.

The improvements embodied in the new starters include: Wider spacing of adjacent fingers; definite stop in the starting position; the running position can only be reached by passing through the starting position; the switch cannot be left in the starting position so as to burn out the transformer windings; automatic features can be fitted to all types (previously they have only been fitted to oil-immersed starters) and in the larger starters, overload releases are fitted with time lags to prevent tripping an any kick which may occur when switching over from the starting to the running position.



Figs. 12 and 13.—E.A.C. Air-Break Auto-Starter, Open and Closed.

The firm supplies star-delta starters of 50-ampere size in the dry type, and for from 25 to 125 amperes in the oil-immersed type, both being totally enclosed, while the latter type can be made watertight, dustproof and flametight if required.

We illustrate in figs. 12 and 13 the firm's air-break, auto-transformer starter which is recommended for textile mills, and rated for 45-second starts four times an hour. The E.A.C. slow-motion starting device in now fitted to this as well as the oil-immersed type. The transformer is now mounted in a separate box above the switch. Automatic releases are fitted, and every part is accessible by removing the cover.

In the oil-immersed type both switch and transformer are oil-immersed, and the coils are rated for 60-second starts six times an hour. The air-break auto-starters are supplied for horse-powers between 5 and 100, while in the oil-immersed type, the sizes range from 5 to 200 H.P.

Electrical Gas Lighters.

Mr. Ferdinand Nehmer, of 173, Highbury New Park, N., has recently introduced a new patented design of electrical gas lighter, which it is claimed is both a simple and efficient means of generating sparks by statical means. The apparatus consists essentially of a stationary vulcanite disk carrying two crescent-shaped field plates of tinfoil, and fitted in a shallow cylindrical case 3 in. diameter lined with vulcanite.

In front of the stationary disk is a rotating vulcanite disk fitted with spiral tinfoil strips and metallic brushes which project at the circumference and serve to collect static electricity from the stationary disk and deliver it to a collector connected with the sparking device at the tip of a projecting tube.

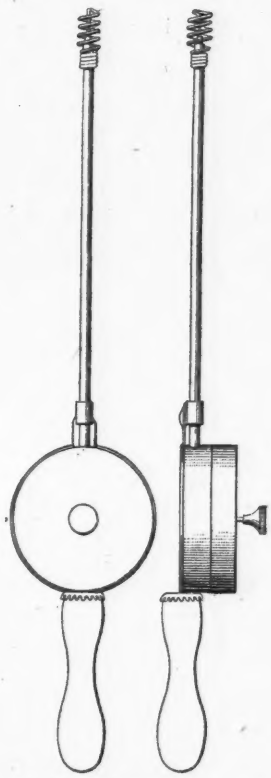


Fig. 14.—New Electric Gas Lighter

The rotating disk is mounted on a short spindle with a milled button on the projecting end, which, on being twisted between thumb and finger, imparts the necessary rotation to produce a suitable train of sparks for gas ignition purposes. Our views, fig. 14, show the external appearance of the device, which, we understand, will be much less costly than similar apparatus previously on the market.

Unbreakable Lamps.—The remarkable strength of the modern drawn-wire lamps is continually being demonstrated by their ability to withstand unpremeditated trials of extreme severity. Recently 600 "Royal Ediswan" lamps were taken in a motor-cycle side car from Calcutta to Ishapore, a distance of 15 miles, partly over wretched roads. Two of the parcels fell overboard when the car was running at full speed, but not a single lamp was damaged, although no special packing was employed.

THE FARADAY SOCIETY.

The first of a group of papers presented at the April meeting of the Faraday Society was by Mr. Charles R. Darling and dealt with recent improvements in recording pyrometers. The paper was of the distinctly practical type, and it really was more or less of a commentary on the admirable exhibition arranged by Mr. Darling of the latest instruments now on the market.

Although the first pyrometric records attempted, namely, by Le Chatelier in 1887, were made with a thermoelectric pyrometer, the Callendar resistance type soon became the more popular in the hands of investigators, and it is only within recent years that the thermoelectric method has, for the more rough and ready practical purposes, almost superseded the resistance instrument. The resistance pyrometer still holds its own as an instrument of research; we were told indeed in the course of discussion that over 400 Callendar instruments were in use, under the charge of men not specially skilled, but on the whole the thermo-couple is more suitable for industrial purposes, and for most practical work it is quite accurate enough. Of late years, moreover, its cost has been considerably cheapened, for the old platinum alloy junctions have largely been superseded by base-metal couples, such as nickel and carbon, or nickel-chrome or iron-nickel alloys, which not only yield higher E.M.F.'s than the precious metals, but can be more easily made homogeneous, and, therefore, are more constant in their behaviour. For temperatures above 1,200° C., however, radiation pyrometers are still to be preferred.

The qualifications required for a modern recording furnace pyrometer are accuracy, within the limits desired, they should be strong and dust-proof, and require little skilled attention, as befits workshop use, and finally they should be capable of taking simultaneously several records. These qualifications are possessed in varying degrees by the principal types described by Mr. Darling.

The recording in most cases is effected by the periodic depression of bar on to the galvanometer needle causing it to mark its position on a moving chart. The record is, therefore, intermittent, but it is sufficiently continuous for practical purposes. Where multiple records are required on the same chart, an automatic switch throws the various circuits consecutively into the galvanometer. In the Siemens-Halske recorder, which is a workmanlike, hardy-looking instrument, the stylus is periodically pressed by clockwork against a transparent chart, on to a type-writing ribbon, forming a dot below, which is visible above. As the stylus is attached to the galvanometer pointer, the temperature scale has to be circular in shape. For a scale divided from 0° to 1,200° C. an accuracy of 5° is possible. In the Leskole recorder the presser-bar is operated by an electromagnet, and the pointer presses against a rotating drum which carries the chart, having first been drawn to the end of the scale and pressed against an inked pad. This instrument, though generally useful, is not suitable for taking simultaneous records.

In the Foster recorder, Hoskins's nickel-chromium alloys are used for the couples, yielding an E.M.F. five times as large as the platinum-rhodium couple. The larger forces available enable the galvanometer coil to be horizontal, so that a vertical pointer is able to mark a vertical circular chart, which rotates on its axis, by means of a capillary ink tube. Robust construction is a feature of this recorder.

The circular, or partly circular, co-ordinates of the charts given by the above instruments will by some be considered a drawback. In the thread recorder, made by the Cambridge Scientific Instrument Co., ordinary rectangular charts can be used. The pointer is depressed by a horizontal bar on to an inked thread, stretched parallel to the axis of the rotating chart; thus the tangential, instead of the radial, movements of the pointer are recorded. A suspended coil galvanometer is used, so that a high degree of sensitiveness is attainable. Simultaneous records can be taken, and multiple records may be secured by the use of an automatic switch.

In a recorder like the Thread, where the deflections start from zero, it is possible to open out the higher scale-readings by making the pyrometer part of a potentiometer circuit and balancing the deflection at the zero point, say, for a temperature of 500°.

Mr. R. W. Paul, following an instrument in use at the Reichsanstalt, takes a great step forward in his instruments in that the moving parts are actuated by a motor instead of by clockwork or by electromagnets. The motor is governed to a high degree of constancy, so that its speed remains constant, even if the voltage variations are 15 to 20 per cent. The motor is geared up to the mechanisms moving the chart, presser-bar and inking ribbon, and the speeds of all these movements can be varied as desired. The galvanometer is of the Unipivot pattern, and the pointer is pressed at intervals on to a typewriter ribbon above the chart. The ample power provided by the motor renders it easy to apply a simple switching device to give almost any number of records in one chart.

An American recorder, made by the Leeds and Northrup Co., of Philadelphia, also makes use of a motor drive, but it is otherwise quite different from the types already described, in that a zero deflection method is used. The pyrometer forms part of a potentiometer circuit, and the function of the mechanism is to oppose an E.M.F. equal to that of the pyrometer. The manner in which the adjustment of the opposing E.M.F. is controlled was explained in our issue of October 24th, 1913, page 649, in the course of an article by Mr. Kenelm Edgcumbe.

Brief mention must suffice of the modern types of resistance recorders described by Mr. Darling, as industrially the use of these is restricted to work of a special character where great accuracy is required; the admirable Callendar instrument, for example—it is too well known to need description—cannot be used when there is any vibration, quite apart from its high cost. A modified, more robust form of the Callendar recorder is made in America by the Leeds and Northrup Co. In this a mechanism is used to operate a resistance in one arm of a Wheatstone bridge and balance the resistance of the pyrometer. Other makers also supply a Wheatstone bridge arrangement, in which the pyrometer is balanced at 0° only, so that the movement of the pointer on the loss of balance is a measure of the temperature.

Now that in the modern motor-driven type of pyrometer considerable power is available, the instrument can be readily used to control the temperature of furnaces, in the case of an electric furnace by regulating its resistance, in a gas-fired furnace by regulating the gas supply, or the coal feed in cases like rotary cement kilns where this is continuous. Many interesting examples of such control were referred to in the course of the discussion. One was a steel works in Wales, where the influx of air into the hot-air main was automatically controlled by a recording pyrometer by which the temperature of the air was kept constant at 700° C. to within 10°. Another example was a spectroscope used for measuring the velocity of stars in the line of sight, which was kept automatically at a constant temperature within $\frac{1}{100}$° C. A further instance mentioned was a large soldering-iron used for piecing up enormous quantities of tinplate, where the whole success of the operation depended upon constancy of temperature. In another example given by one of the speakers, the temperature of a large number of vats had to be controlled. Resistance thermometers were used in conjunction with a recorder. By suitably graduating the chart and fitting the recorder with a change-over switch, the temperature of each vat is recorded in a different colour.

The Embrittling of Iron by Caustic Soda.—A most interesting study of this peculiar manifestation of passivity, or, perhaps, quasi-passivity, was communicated to the meeting by Mr. J. H. Andrew, M.Sc., of the University, Manchester. The deteriorative effect of caustic soda upon iron and mild steel has been known for some time, and Mr. Andrew's experiments were for the purpose of finding out the cause of this embrittling action. In these rough and polished specimens of wrought-iron were immersed for some months in concentrated caustic soda solution kept at 100° C. At first the corrosion of the polished metal was less than that of the rough filed, but eventually both became highly crystalline, and the corrosion rate was the same in each case. The brittleness is thus associated with recrystallisation; with prolonged immersion it disappears, and the corrosion decreases almost to nothing.

Following the well-known work of Beilly and others, it is suggested that the iron consists of a crystalline phase and an amorphous vitreous phase, the latter surrounding the crystals and binding them together. When immersed in caustic soda, a potential difference will be set up between the two phases and electrolysis will take place, hydrogen being set free. This hydrogen will diffuse into the interior of the metal, in the first instance being absorbed by the amorphous phase; first, because it is there liberated, and secondly, because there is reason to regard the amorphous phase of metals as a supercooled liquid in which hydrogen would be much more soluble than in the crystalline phase. This absorption of hydrogen will force the crystals apart, break down the crystalline cohesion and also facilitate recrystallisation, thereby forcing the crystals apart. This, it is supposed, is the cause of the initial embrittling. As both the crystalline and amorphous phases of the iron became saturated with hydrogen, the P.D. between them, which will depend on the relative concentrations of the hydrogen, will diminish, and so the corrosion will in time also become less active, and thus iron will become "passive" on immersion in caustic soda.

The special interest of Mr. Andrew's experimental facts and theory at the present moment is that they fall so well into line with the view now being so generally accepted by metallurgists, that the mechanical properties of all metals are dependent upon the amorphous cement which exists between the crystalline grains when the metals are cooled from the liquid state.

Goods Transport Reform.—On Thursday last week, Mr. A. W. Gattie, by request, addressed a meeting of members of the House of Commons on the subject of economy in the transport of goods by rail, with special reference to the establishment of a Goods Clearing House in London, to take the place of the 74 goods stations at present existing. The Clearing House, operated entirely by electric power, would be able to deal with 100,000 tons of goods per 24 hours, and besides expediting the transport of goods and eliminating enormous waste of time and money, would enable the work of 100,000 carts and vans to be dealt with by 5,000 motor lorries, with immense benefit to London traffic. The author stated that the London vans placed end to end would stretch 400 miles, and that they were on the average standing still in the streets for 9 hours a day. Under Clearing House conditions the delivery and collection of goods would be organised so that the vehicles were usefully employed all the time. Declaring that there was nothing experimental about the scheme, which had been tested on full-size scale, Mr. Gattie asked for a Board of Trade inquiry into the subject.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

AMENDMENTS.

FRANCE.—The Customs Authorities have decided that hanging apparatus for electric incandescent lighting with pulley and counter weights, even without the conducting wires or lamp support, are to be dutiable as "electro-technical apparatus" at rates varying from 20 to 80 francs per 100 kilogs. according to weight.

CANADA.—The following are changes in the Canadian tariff, in so far as they concern the electrical trade, which have recently been put into force:—

Carbons over six inches in circumference or outside measurement and not exceeding 35 inches in circumference or outside measurement	Free.
Carbon electrodes exceeding 35 inches in circumference or outside measurement ...	12½ p.c. *ad. val.*
Galvanised iron or steel wire, curved or not, numbers 9, 12 and 13 gauge with variations from such gauges, not exceeding four one-thousandths of an inch and not for use in telegraph or telephone lines	Free.
Electric dental machines	15 p.c. *ad. val.*
Miners' safety lamps	Free.
Electric or magnetic machines for separating or concentrating iron ores	Free.

The duties in each case are those leviable under the preferential tariff applicable to British goods.

It has also been decided that the duty on advertising matter, including catalogues and price lists, imported after July 1st, 1914, may be paid by Customs Revenue Stamps under regulations by the Minister of Customs at the rates specified in the tariff (viz., 10 cents. per pound), except that on each separate package weighing not more than one ounce the duty shall be 1 cent. The lack of facility for senders of catalogues paying the duty by affixing revenue stamps to parcels posted, which operates in certain other Dominions, will thus be removed and presumably the Government will notify at a later date where such stamps may be obtained in London.

AUSTRALIA.—The Customs Authorities have decided that advertising blotters and advertising calendars with water-colour pictures thereon are to be dutiable as advertising matter at the rate of 6d. per lb. or 35 per cent. *ad. val.*, whichever rate returns the higher duty.

SOUTH AFRICA.—The Board of Trade have received from H.M. Trade Commissioner in South Africa further rulings which have been given by the Union Commissioner of Customs to the Cape Town Chamber of Commerce regarding the composition of the value of goods for calculation of *ad. valorem* duty. In regard to the term "place of purchase," the Commissioner was asked for his decision as to the values of goods which are purchased from an inland factory—say in Great Britain—and the railway carriage is added to the cost to the importer at the place of purchase. The Commissioner decided that provided the price paid at such factory is not less than the value for consumption in the country of origin *duty should not be charged upon such* railway carriage. In the event, however, of the factory charging the same price free on rail or at the factory or at any town or other part of Great Britain, it would not be permissible to deduct the cost of railway carriage as the invoice including it was clearly the "value for home consumption." The Commissioner of Customs also stated that he was making enquiries with a view to securing uniformity of practice in the ports of the Union in regard to the assessment of duties and the interpretation of the Customs Regulations issued by the Department of Customs.

The new proposals which have been introduced by the South African Government for the modification of the tariff include the reduction of the duty on railless cars from 12 per cent. *ad. valorem* if British to "free"; if foreign the duty is to be reduced from 15 per cent. *ad. valorem* to 3 per cent. *ad. valorem*. It is also proposed to admit free of duty catalogues from oversea firms irrespective of conditions as to weight, quantity, etc., now imposed. A further proposal provides for the imposition, in the case of "dumped" goods similar to those made or produced in the Union, of a duty equivalent to the difference between the selling price of the goods for export and their true current value for home consumption. Countervailing duties are also proposed in respect of bounties equivalent to the value of the bounty.

TOGOLAND.—The Customs Authorities have decided that machinery of all kinds shall in future be free of duty on importation.

NEW PATENTS APPLIED FOR, 1914.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

11,561. "Apparatus for converting alternating current into pulsating direct current." W. OTTO. May 11th. (Convention date, May 24th, 1913, Germany). (Complete).

11,564. "Electric impulse transmitting-device." E. C. R. MARKS. May 11th. (Canadian Independent Telephone Co., Ltd., Canada). (Complete).

11,599. "Portable electric safety lamps for use in mines or other places." L. BRISTOL. May 11th.

11,610. "Anodes and hooks for suspending them." H. R. BOISSIER. May 11th. (Convention date, May 9th, 1913. United States). (Complete).

11,612. "Wall plugs or sockets." I. B. MALABY. May 11th. (Complete).

11,621. "Machine for cutting electric bulbs for regenerating them." BARON A. O. VON BATORKEZ UND VERINKHAZ. May 11th. (Convention date, May 10th, 1913, France). (Complete).

11,624. "Electric igniters." F. CELERI. May 11th. (Complete).

11,629. "Mechanism for and method of operating switches." R. V. COLLINS. May 11th. (Convention date, May 13th, 1913, United States). (Complete).

11,630. "System for signals and motor control for electric roads." R. V. COLLINS. May 11th. (Convention date, May 13th, 1913, United States). (Complete).

11,644. "Metallic-vapour lamps." KORTING & MATHIESEN AKT. GES. May 12th. (Convention date, May 21st, 1913, Germany). (Complete).

11,654. "Telephonic receivers." G. J. LARSSON. May 12th.

11,657. "Indicating-arrangements for electricity supply systems." A. J. J. MARGUEROND and R. F. J. D. DU ROUSSET. May 12th. (Complete).

11,669. "Clip to connect and hold cross wires together." H. I. ROBERTS. May 12th.

11,676. "Construction of anode." S. O. COWPER-COLES. May 12th.

11,677. "Apparatus for coating sheets and plates in continuous lengths." S. O. COWPER-COLES. May 12th.

11,708. "Arrangements for wireless telegraphy and telephony." J. SCHIESSLER. May 12th. (Divided Application on 29,447/13. December 20th. Convention date, October 16th, 1913, Austria). (Complete).

11,709. "Antennae for wireless telegraphy or telephony." J. SCHIESSLER. May 12th. (Divided Application on 29,447/13. December 20th. Convention date, October 16th, 1913, Austria). (Complete).

11,721. "Apparatus for detecting the presence of injurious gases in mines and like places." SCHOELLER & Co. May 12th. (Convention date, January 12th, 1914, Germany). (Complete).

11,739. "Insulating-devices for electric traction systems." BRITISH THOMSON-HOUSTON CO., LTD. May 12th. (General Electric Co., United States).

11,793. "Electric rear lamps." E. A. KNIGHT. May 13th.

11,794. "Electric circuit breakers and switches." D. K. MORRIS and MORRIS & LISTER, LTD. May 13th.

11,808. "Electric and other motor driving-arrangements for looms and other machinery." J. FEYER. May 13th. (Addition to 7,237/12. Convention date, May 13th, 1913). (Complete).

11,832. "Protective devices for electric circuits." BRITISH THOMSON-HOUSTON CO., LTD. May 13th. (General Electric Co., United States).

11,837. "Apparatus for coverting direct into alternating currents and vice versa." E. FALKENTHAL. May 13th. (Complete).

11,840. "Switches." F. E. WILSON. May 13th.

11,841. "Control apparatus for electric lighting systems on motor cars." F. E. WILSON. May 13th.

11,844. "Induction meter with three-armed driving core." ALLGEMEINE ELEKTRICITATS GES. May 13th. (Addition to 3,912/14. Convention date, May 17th, 1913, Germany). (Complete).

11,845. "Process for the renewal of conduits with internally packed and externally lead-filled sockets." A. A. C. BOAS and J. QUIST. May 13th. (Convention date, May 14th, 1913, Denmark). (Complete).

11,852. "Electro-magnetic levitating-apparatus." E. BACHELET. May 13th.

11,863. "Electro-magnetic measuring-instruments. F. J. GREEN. May 14th.

11,870. "Automatic time switches." H. BOOTHROYD. May 14th.

11,881. "Magnetic compasses." M. B. FIELD. May 14th.

11,895. "Electric motors." H. F. CHRISTIE. May 14th.

11,920. "Flash lamps." W. J. MELLERSH-JACKSON. May 14th. (Interstate Electric Novelty Co., United States). (Complete).

11,928. "Generating electro-magnetic oscillations or high frequency currents and methods derived therefrom for producing a continuous wave-flux or a continuous electro-magnetic flux or continuous current." R. ARNO. May 14th. (Complete).

11,934. "Method and means of producing oscillatory currents of electricity of small decrement and close wave trains from alternating and continuous currents of electricity." H. MANDERS. May 14th.

11,937. "Electric heating apparatus." A. F. BERRY. May 14th.

11,940. "Electric signalling installations." SIEMENS BROS. & Co., LTD. May 14th. (Siemens & Halske Akt. Ges., Germany). (Complete).

11,942. "Flash lamps." W. J. MELLERSH-JACKSON. May 14th. (Interstate Electric Novelty Co., United States). (Complete).

11,943. "Electric switches." BRITISH THOMSON-HOUSTON CO., LTD. May 14th. (General Electric Co., United States).

11,950. "Process for the treatment of ores and solid salts by electro-chemical reduction." A. A. M. HANRIOT. May 14th. (Convention date, May 22nd, 1913, France). (Complete).

11,962. "Electro-magnetic levitating and propelling apparatus." A. H. DOUBLEDAY. May 15th.

11,993. "Magnetic fixing-devices." NORMA CIE G.M.B.H. May 15th. (Convention date, May 17th, 1913, Germany). (Complete).

11,996. "Electrically-heated boiling plates and the like." G. PATE and A. R. WOOD. May 15th. (Complete).

12,005. "Electric ignition-plugs for internal-combustion engines." D. ROBERTS. May 15th.

12,018. "Subaqueous sound signal receivers." SIGNAL G.M.B.H. May 15th. (Convention date, May 29th, 1913, Germany). (Complete).

12,032. "Testing insulation." EVERSHED & VIGNOLES, LTD. and S. EVERSHED. May 15th. (Divided Application on 12,723/13. May 31st).

12,035. "Control or regulation of motors." VULCAN-WERKE HAMBURG UND STETTIN AKT. GES. May 15th. (Convention date, January 2nd, 1914, Germany). (Complete).

12,039. "Electrical machines." F. JUAN. May 15th.

12,047. "Self-propelled vehicles." BRITISH THOMSON-HOUSTON CO., LTD. May 15th. (General Electric Co., United States).

12,048. "Control or regulation of motors." VULCAN-WERKE HAMBURG UND STETTIN, AKT. GES. May 15th. (Addition to 12,035/14. Convention date, March 3rd, 1914, Germany). (Complete).

12,057. "Electric furnace, particularly adapted for the manufacture of nitrides." G. COUTAGNE. May 15th. (Convention date, May 23rd, 1913, France). (Complete).

12,059. "Electric lamp holders." W. ADAMS. May 15th.

12,068. "Lamp holders." C. G. M. Bennett and C. H. Jeffcoat. May 15th.

12,132. "Emulsion for cleaning vulcanite or ebonite." A. E. F. Rose. May 16th.

12,150. "Dynamo and system of electric lighting for trains and the like." H. Leitner. May 16th.

12,156. "Electric gas lamps." A. Lederer. May 16th. (Convention date, May 19th, 1913, Austria). (Complete).

12,157. "Electric gas lamps." A. Lederer. May 16th. (Convention date, May 19th, 1913, Austria). (Complete).

12,158. "Electric gas lamps." A. Lederer. May 16th. (Convention date, May 19th, 1913, Austria). (Complete).

EXPIRING PATENTS, TAKEN OUT IN 1900.

1,617. "Carbon Contacts." Reichwald, A. (F. Krupp.) January 25th. A carbon contact for switches, &c., is formed of a conical block of carbon secured in a holder by means of a collar bored to receive the carbon and screwing on to a base.

1,863. "Electromagnets." Heys, W. G. (Scott, J., Varley, R., and Anderson, J. C.) January 30th. A number of similar coils of helices are formed by winding the several conductors in layers upon separate zones of a single core, such as a paper tube, successive layers of each helix being separated from one another by insulating-sheets extending throughout all the helices; alternative forms are described.

1,864. "Electromagnets." Heys, W. G. (Scott, J., Varley, R., and Anderson, J. G.) January 30th. Consists in a method of simultaneously winding a number of similar coils or helices on a single core.

2,222. "Electricity, measuring." Wright, A., and Reason Manufacturing Co. February 3rd. A mercury voltameter consists of a glass vessel, closed by a stopper at the top, or entirely sealed, containing a mercury anode in a pocket at a higher level than a mercury cathode, and having platinum connecting wires sealed into it. The vessel is filled with a solution of mercurous nitrate, or other suitable electrolyte. When the instrument is in use the mercury cathode increases in volume and overflows a lip or ridge into a long vertical tube, which at starting contains solution only. The position of the anode causes the dense solution produced on its surface to flow down to the cathode. The height of the mercury in the vertical tube is measured by an adjacent scale, indicating the quantity of electricity which has passed.

2,260. "Electric Lamps." Bremer, H. February 5th. A lamp has its carbons fixed, or periodically fed by clockwork, which is released by a solenoid; or the carbons may be carried in inclined holders, one of which is movable towards the other by an electromagnet in a shunt circuit, when this circuit is closed by expansion of a metal tube situated above the arc and heated by it. A long arc is produced, and is controlled by an adjacent solenoid or electromagnet, connected in series with the arc, and tending to deflect the arc and lengthen it if the main current increases. The carbons are preferably arranged side by side, either parallel, or inclined, with the deflecting-magnet between them, and the arc may be formed within a glass cylinder, open below but having a metal cover to retain hot gases. A loop of tube may lead from the cover to a lateral receptacle and back to the glass cylinder, so that gas may circulate through it and deposit impurities in the lateral receptacle. The carbons may contain metalloids or metal salts.

3,461. "Electromagnetic Brakes." Westinghouse Brake Co. (Newell, F. C., and Herr, E. M.) February 21st. One arrangement shows an electromagnetic rail brake which is adapted to apply non-magnetic wheel brakes. The core of the electromagnet is wound with three coils of wire arranged in series in a local circuit with the motor. To ensure automatic regulation of the braking according to the speed attained, the three coils are wound with different numbers of turns of wire. The magnetic brake is suspended by springs and when the shoes are applied to the rail the dragging action causes the application of the wheel brakes by means of levers. Modifications are described. Another form is described in which the magnetic brakes are applied to the wheels.

3,865. "Engine Governors." Hepburn, G., and Evans, D. H. February 28th. Comprises engine governor or stop mechanism suitable for engines driving electrical generators, which is adapted to come into action in case of a breakdown, or in case the load is suddenly taken off the engine, but which is inoperative while the engine is running under normal conditions.

3,968. "Telegraph Recording Instruments." Muirhead, A., and Edgar, R. H. March 1st. Relates to improvements in siphon recorders of the type described in Specification No. 20,793, A.D. 1893. A coil is suspended by two adjustable threads or is pivoted to a stationary core between the magnet poles, a mirror being fixed opposite an opening. The coil is provided with pins upon which a yoke can engage. The yoke carries fibres connecting to the siphon cradle, springs being inserted in the fibres. The cradle is supported above by two wires arranged to pass over a guide-edge or equivalent arrangement, adjustments being provided for regulating the period of oscillation, the zero and the vertical position. The coil is double-wound, one part being in a shunt connection with a variable resistance.

5,046. "Electricity, Measuring." Wright, A., and Reason Manufacturing Co. March 16th. Mercury voltameters are provided with registering mechanism operating by means of gravity. In one arrangement a mercury anode is contained in a small glass dish attached to a vertical glass tube, the upper end of which carries a pointer near a stationary scale, and which is suspended by a helical spring. Electric connection is made with the anode by a platinum wire in a glass tube. The anode is suspended in a vessel containing the electrolyte, and a mercury cathode at the bottom. As current passes the anode becomes lighter, and the pointer rises. This arrangement may be used with the movable part connected as cathode, the cathode surface being provided by a conical coil of platinum wire, or a porous carbon block; the anode is mercury in an annular trough, above the cathode. Various modifications are described.

5,593. "Electricity, Measuring." Wright, A., and Reason Manufacturing Co. March 24th. Relates to quantity meters, more particularly to mercury voltameters such as are described in Specification No. 2,222, A.D. 1900, which are provided with various improvements.

(To be continued.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C.; and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1912.

24,898. Excitation of Dynamo-electric Machines. A. Rolfe. October 31st. (January 21st, 1913).

1913.

2,169. Production of Electric Contacts. C. Scott & W. Deats. January 27th.

2,302. Selecting Devices for Telephone Systems. A. Katz. January 28th. (January 29th, 1912).

7,252. Charging of Accumulators from a Variable-speed Dynamo-electric Machine. J. P. G. Thomas, & Thomas Transmission, Ltd. March 26th.

9,105. Method of and Means for Heating Substances by Electricity. T. W. Broadbent & F. W. Davies. October 14th. (October 14th, 1913).

9,447. Resistance for Regulating the Current in an Electric Circuit. M. Mansell. April 22nd. (October 22nd, 1913).

9,959. Variable Resistances for Automatic Regulation of Electric Currents. A. G. Bloxam (Robert Bosch, Firm of). April 28th.

10,188. Means for Raising and Supporting Arc and other Lamps and the like. G. A. Hughes. April 30th.

10,190. Electrically or Mechanically-vibrated Diaphragm Horns or Warning-devices. G. St. B. S. Watkins. April 30th.

10,500. Electric Soldering-irons. A. H. Railing and A. J. D. Krause May 5th.

10,609. Device for the Automatic Maintenance of Phase-equality of the Currents of Parallel-connected Alternating-current Machines. Allgemeine Elektricitäts Ges. May 5th. (May 4th, 1912).

10,656. Starting of Internal-combustion Engines. H. Leitner. May 6th.

10,770. Starting and Controlling Devices for Electric Motors Driving the Blowing Apparatus of Organs or the like Musical Instruments. L. B. Cousans. May 7th

11,313. Control of Alternating Current Commutator Electric Motors. Siemens-Schuckertwe ke Ges. May 14th. (May 14th, 1912).

11,623. Electrically-operated or Controlled Valves. E. C. Irving and J. P. O'Donnell. May 19th.

11,751. Electrical Relays. J. H. Baker and A. E. McKechnie. May 20th.

12,639. Apparatus for use in Charging Electric Accumulators. H. Leitner. May 30th.

14,742. Electric Starters for Internal-combustion Engines. W. H. Scott. June 26th.

15,046. Metal Vapour Arc Lamps. Deutsche Gasglühlicht Akt. Ges. (Auerges). June 30th. (February 4th, 1913).

15,283. Method of and Means for Determining the Electrical Characteristics of High-frequency Oscillation Circuits. E. D. Carden. July 2nd.

15,541. Signs. E. C. R. Marks (Savage Novelty Co.). July 5th.

15,642. Electric Switches Mechanically Controlled from a Distance. F. Hodgson. July 7th.

16,084. Tail-lights of Motor-driven Vehicles. T. Norton. July 12th.

16,485. Electric and Gas Radiator. V. Lacasse. July 17th. (July 17th, 1912).

17,005. Mounting of Electromotors on Tramway Vehicles. C. Delmez. July 24th. (Patent of Addition not granted).

17,066. Apparatus for Automatically Indicating and Recording the Combined Efficiency of a Steam Motor and Coupled Electrical Generator. R. S. Xenaky and F. Gilman. July 25th.

18,902. Antiseptic Paper Cover for the Mouthpieces of Telephone Transmitting Instruments. H. Smith. August 20th.

19,022. Distribution Systems for Vapour Electric Devices. British Thomson-Houston Co. (General Electric Co.). August 21st.

21,509. Magneto-electric Ignition Apparatus. W. A. Hill (Apparate-Bauanstalt Fischer Ges.). September 24th.

22,127. Electric Switches for Railways. Soc. d'Electricite Mors. October 1st. (October 30th, 1912.)

22,176. Brush or like Sliding Contacts for High Frequency or Electrical Apparatus. A. S. Sorensen. October 2nd.

22,228. Generator of Electricity for Automobiles, forming a combined source of Ignition and Illumination. A. Sanchez and C. Baradat. October 2nd.

22,386. Signalling and Controlling Locomotives and the like Running on Tracks. J. Partington. October 4th.

23,035. Replacement Fuses Applicable also for Use as Electric Switches. G. O. Donovan. October 13th.

23,189. Starting Devices for the Engines of Motor Cars and the like. H. Lucas and W. C. Turner. October 14th.

23,314. Starting of Motor Cars. B. Burow & E. Burow. October 15th.

23,388. Anti-vibration Devices for Lamps. W. P. Taylor and J. Willis. October 16th.

23,720. Electrical Resistance Thermometers. W. J. Mellersh-Jackson (Packard). October 20th.

23,754. Brushes for Electric Contacts. J. E. Colas and Soc. d'Electricite "Nilmelior." October 20th. (November 26th, 1912.)

24,162. Oil Transformers. H. Weiss. October 24th. (October 26th, 1912)

24,355. Magnetic Separators. Fried. Krupp. Akt. Ges. Grusonwerk. October 27th. (November 27th, 1912).

24,419. Electric Toasters. C. P. Madsen. October 28th. (October 28th, 1912).

24,471. Electric Batteries. F. S. B. De Mello. October 28th. (December 4th, 1912.)

24,898. Apparatus for Electrically Lighting Road Vehicles and the like. E. P. Prior. November 1st.

25,675. Connection Plugs for Electric Circuits. F. H. Chapman and O. E. Kenney. November 10th. (February 24th, 1913).

26,150. Springs Used in Electrical Work. S. G. Leach and H. F. Joel, Junr. November 14th.

26,287. Telephone Systems. E. A. Graham. November 15th.

29,003. Flexible Connections for Electric Conductors. Siemens Bros. Dynamo Works, Ltd. (Siemens Schuckertwerke Ges.). December 16th.

29,203. Ventilation of Dynamo-electric Machinery. Siemens Bros. Dynamo Works, Ltd., and E. O. Kieffer. December 18th.

29,763. Rectifier for Alternating Polyphase Currents. Siemens Bros Dynamo Works, Ltd. (Siemens Schuckertwerke Ges.). December 24th.

1914.

83. Apparatus for Converting Telegraphic Code Figures into Words. A. W. C. Voigstberger, H. West and J. West. January 1st. (Addition to 9,195/12.)

106. Packing Enclosure for the Cells of an Electric Battery. B. Pordes. January 2nd.

2,843. Electric Incandescent Lamps. F. Loewenstein. February 3rd.

2,850. Electrolytic Meters. British Thomson-Houston Co. (General Electric Co.) February 3rd.

3,004. Electric Releasing Device for Drawing-off Apparatus composed of a Plurality of Weighing or Measuring Devices and intended for use in connection with Goods Packing Machines. Fr. Hesser Maschinenfabrik Akt. Ges. February 5th. (March 7th, 1913.)

3,252. Means or Arrangements for Controlling a Source of Light. S. Eisner. February 7th.

4,082. Impulse Transmitting Mechanism for Telephone Systems. R. C. M. Hastings. February 17th. (Divided applications on 9,986/13, April 28th.)

5,037. Telegraphy. W. Judd, B. Davies, & Eastern Telegraph Co. February 26th. (Divided Application on 9,768/13. April 25th).

5,070. Interrupters for Electric Circuits. A. Pollak. February 27th. (February 27th, 1913).

5,831. Telegraphy. W. Judd, B. Davies, & Eastern Telegraph Co. March 7th. (Divided Application on 9,768/13. April 25th).

5,828. Rotors for Dynamo-electric Machinery and Cooling Arrangements for the same. Siemens Schuckertwerke Ges. March 7th. (March 10th, 1913.)